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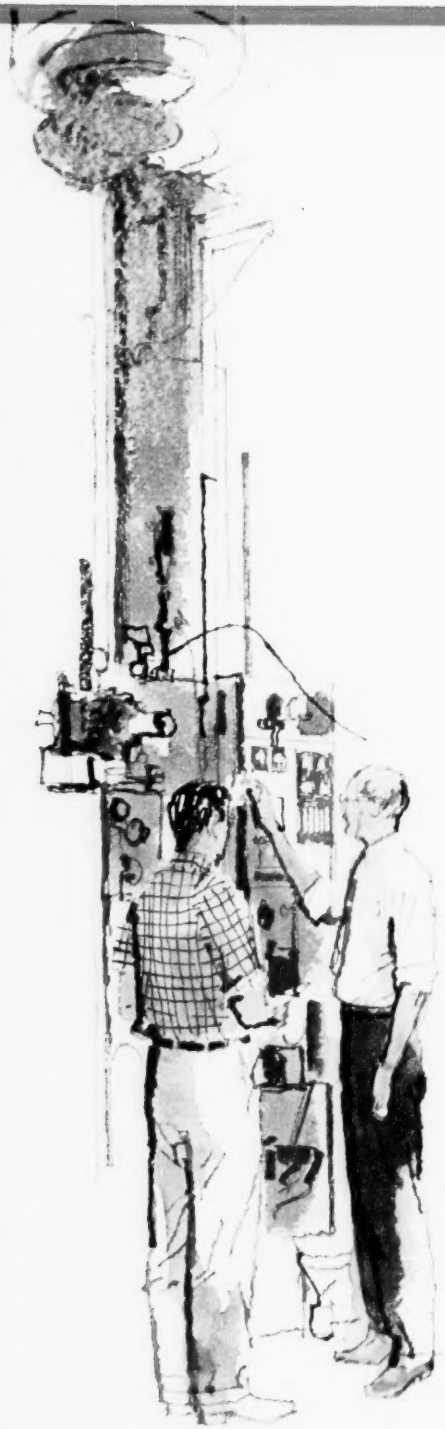
Chemical Week



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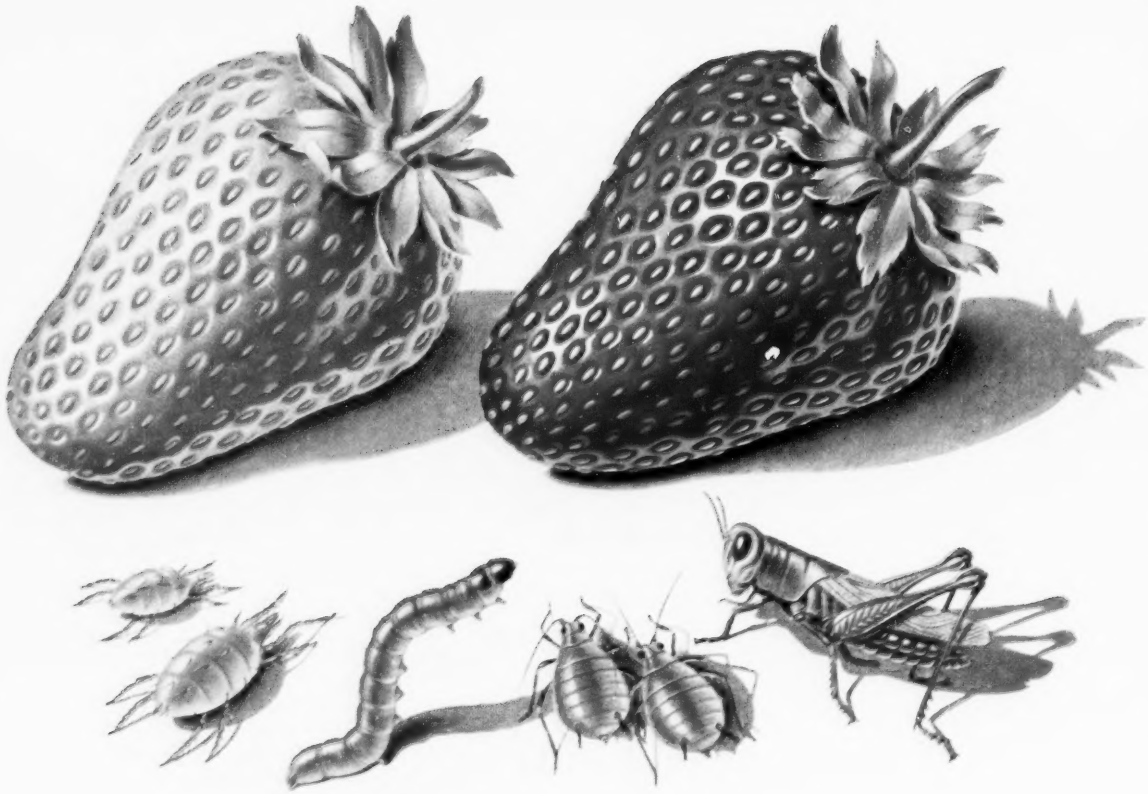

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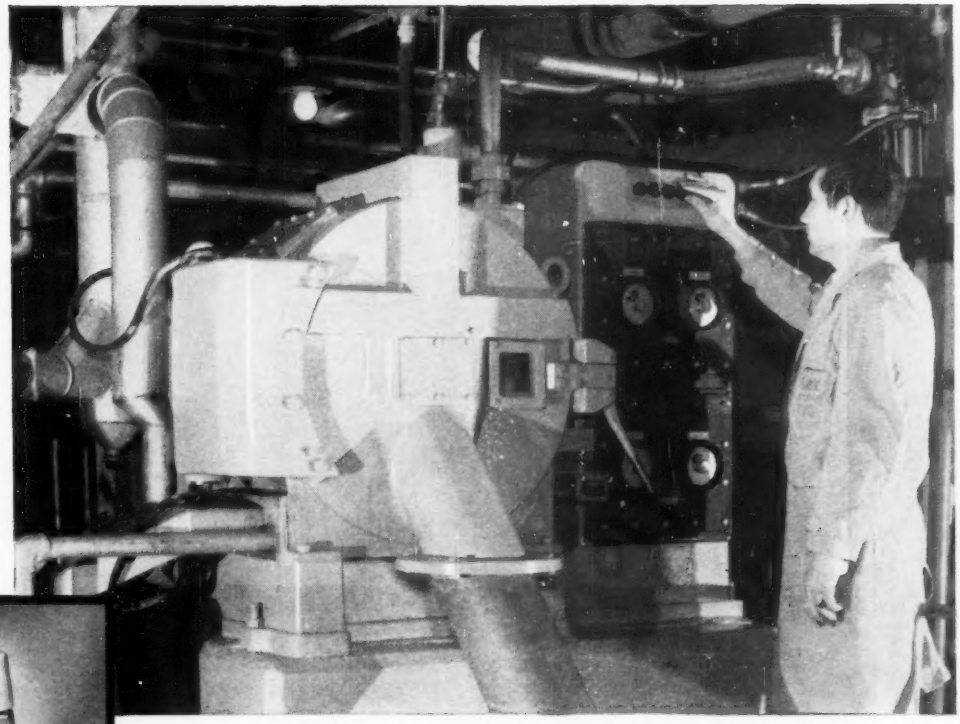

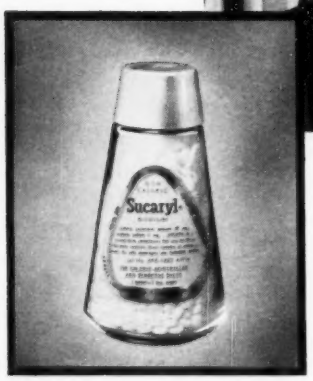

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See our insert in Chemical Engineering Catalog for additional information.

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359

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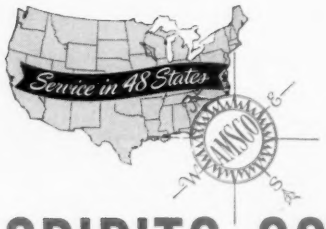

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Chemical Week

TOP OF THE WEEK **JUNE 7, 1958**

- **Pfizer charged with citric acid monopoly** in suit filed last week by U.S. Dept. of Justice ..... **p. 15**
- **Air Reduction makes $12-million bid for synthetic fiber market.** Polyvinyl alcohol plant will be built in Kentucky; fiber pilot unit slated for New Jersey. ..... **p. 15**
- **Research in the balance pan.** National Science Foundation, with data on how much industry paid for research, wants to find out how efficient it was. ..... **p. 35**
- **Is novel formulation of specialties enough?** Inventor finds problems are just beginning when he starts to make and sell nylon-containing furniture and auto polish ..... **p. 74**

40,045 copies of this issue printed

COVER PHOTO—COURTESY OF CALIFORNIA RESEARCH CORP., STANDARD OIL CO. OF CALIFORNIA

Vol. 82
No. 23

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How does rubber

Chemists had a hard time making synthetic rubber until they understood just how it stretched. They got nowhere until they tried X-ray diffraction analysis. After staring at the glowing screen for countless hours, they began to imagine the theoretical molecular structure of this remarkable material that allows us to roll in comfort over the roughest roads, keep our feet dry and erase our mistakes.

Scientists observed that the molecular pattern of rubber was pretty much of a jumble *until it was stretched*. In the stretched condition, the molecules lined up neatly. What kind of a molecular structure would act like this?

Picture some long, thread-like molecules that resemble the bead chain that you use to hold your house and car keys together. Each of the particles, or "beads," is vibrating strongly at right angles to the axis of the molecule, and it exerts a repulsive force in that

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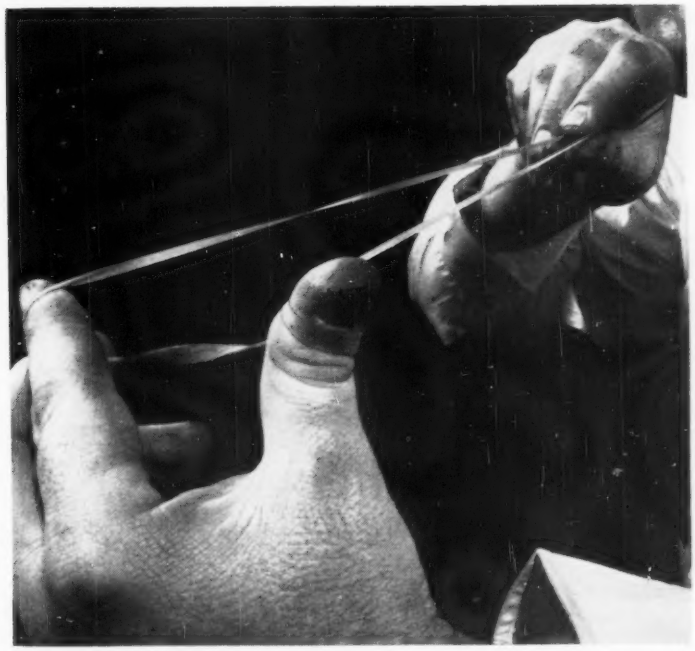

stretch?

direction. Each particle also vibrates less strongly *along* the axis of the molecule—and exerts just enough repulsive force to keep the particles from touching.

When a great many of these thread-like rubber molecules are stretched, they line up parallel and very close to each other—like a bundle of wires in a cable. But it's a different story when the tension is released: since each particle in the molecule radiates a repulsive pressure, every molecule pushes violently against its neighbor. The result is a chaotic jumble of twisted molecules—just as the X-ray diffraction analysis showed.

A great deal of the synthetic rubber made by the co-polymerization of styrene with butadiene starts with USS One-Degree Nitration-Grade Benzene. For more information, write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pa. *USS is a registered trademark*

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VIEWPOINT

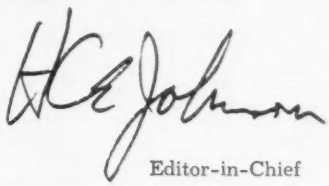
The "discipline of the marketplace" will make itself felt this year, Martin Gainsbrugh, National Industrial Conference Board economist, last week told members of the Synthetic Organic Chemical Manufacturers Assn. in a talk that crystallized the consensus of most thoughtful businessmen.

This discipline, Gainsbrugh thinks, will be particularly evident in collective bargaining. Because wage hikes have for many years outstripped productivity gains, prices have continued to rise in the face of a falling economy. Stiffened resistance this year to unwarranted wage demands can bring—if not lower prices—at least stable prices.

Prices are subject to factors other than wage rates, of course. Such familiar pressures as competition and the need for a fair profit press from opposite sides to keep prices within fairly narrow confines. And even if chemical output should soon recover from its relatively modest downturn, the capacity buildup during the past several years will keep an effective lid on price inflation.

These economic currents are fairly obvious. Less obvious is Gainsbrugh's belief that we cannot look forward to a resumption of the *status quo* of prerecession years—1955-56 in particular, but more generally since World War II. That period was marked by an abnormally high expenditure, in proportion to gross national product, on such consumer durables as automobiles, major appliances and housing. Not for years, very likely, can we expect consumer durables to account for as high a proportion of our total economy as in the years 1946-56.

Marketers of chemical process products cannot hope, then, simply to recover their lost business. It's gone—for awhile. They must develop new customers among makers of consumer nondurables and purveyors of services. Those who learn that lesson quickly may well be leading the pack five years hence.



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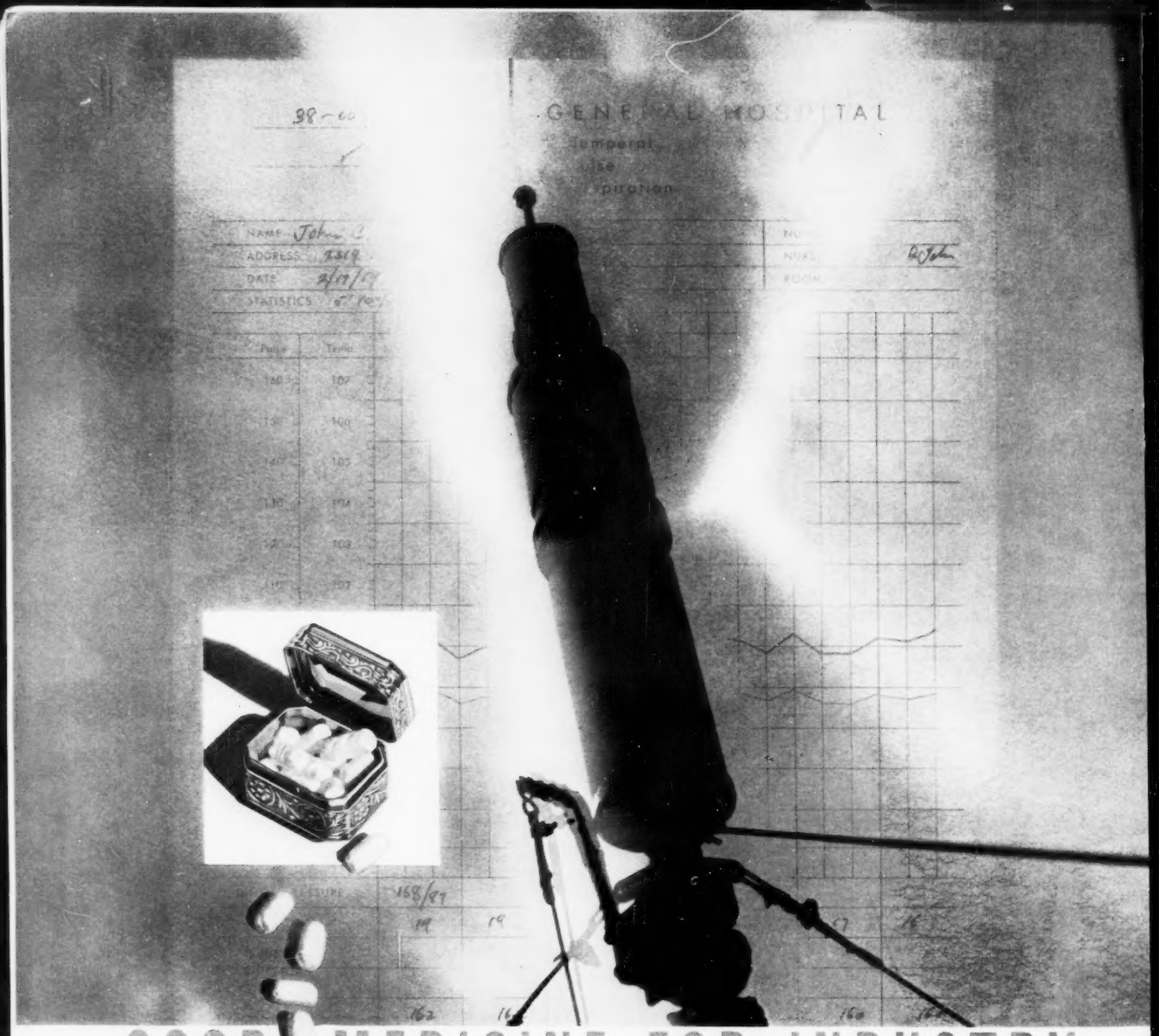

GOOD MEDICINE FOR INDUSTRY

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Business
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CHEMICAL WEEK
June 7, 1958

Monsanto's views on chemical business and chemical tariffs were aired last week. And on both subjects, Monsanto spokesmen pulled no punches.

At Boston, Monsanto's Board Chairman Edgar Queeny and Vice-President Irving Smith told security analysts that reduced sales (down 16%), lower selling prices and higher costs—in that order—were major reasons for the 47% drop in first- quarter earnings of the company's U.S. and Canadian operations.

The sales slip alone accounted for about 45% of the profit dip. Greatest areas of decline: wood preservatives and agricultural chemicals, down 37%; petroleum products, down 18%; plastics, synthetic resins and coatings, down 17%; phosphate products and detergents, down 15% (due to switch in All detergent sales; in the '57 quarter, they sold at retail prices; in '58, at industrial prices to Lever Brothers).

Despite sliding profits, Monsanto intends to maintain expansion outlays at about last year's level—$50-$55 million. Major expansion projects for '58: styrene and polyethylene, phenol and *p*-nitrochlorobenzene, acrylonitrile. A new high-octane gasoline-from-naphtha catalytic reformer and a 100-tons/day urea plant are slated to go onstream this year at El Dorado, Ark.

Research expenditures will be stepped up 5.1% this year, to $23.8 million.

To maintain a firm foothold in European markets after the Common Market tariff barriers go up, Monsanto is expanding its European holdings now, Queeny told the analysts.

Most promising wedge into the Common Market: Sicedison, the petrochemical firm Monsanto formed in '51 with Societa Edison (Milan). At the end of last year, Monsanto held a 13.3% share; since then, it has increased its interest "substantially."

In his slashing counterattack on free-traders, Monsanto Chairman Queeny angrily denied that his espousal of tariff protection for synthetic organic chemicals makes him an "anticapitalist." That was the epithet applied to chemical industry leaders by one of the speakers at the recent bipartisan rally for reciprocal trade extension (*CW, April 5, p. 24*).

His mince-no-words rebuttal of current arguments by liberal traders includes charges that those arguments contain fallacies and errors that result from "a certain intellectual sloth" on the part of uninformed or misinformed ghost writers. Queeny's 10-page blast—which is being distributed by Synthetic Organic Chemicals Manufacturers Assn. to all members—asserts that some prime advocates of lower tariffs think it desirable to lower U.S. standards of living to raise living standards in other coun-

tries. This might be desirable or even inevitable, he goes on, "but intellectual honesty requires that the American people be told of the goal, of the course, and of its natural result."

•

Germany's chemical boom is barely dented by the U.S. recession. First-quarter West German chemical sales hit $1 billion, a 5% increase over last year's first quarter. The rise is a leveling off from last year's first-quarter rise of 16%. This was due primarily to smaller construction and textile industry orders.

Star performer: plastics. Output rose to 155,000 tons last quarter, 16% over the '57 period. And more increases are in sight, due to continued heavy investments and research in high-molecular materials.

•

On the heels of the civil antitrust complaints filed late last week against citric acid and dyestuff producers (*p. 15*), the Justice Dept. this week scored an important procedural victory in its suit against the "Big Three" soapmakers (*CW, March 9, '57, p. 100*). The Supreme Court ruled that the government will not have to let the soap companies inspect the grand jury transcript on which the charges are based.

•

Reinforcing industry's view of the present Justice Dept. staff as an increasingly powerful and persevering policeman: the department's success in getting a federal grand jury at Alexandria, Va., to indict 29 major petroleum companies for allegedly acting in unlawful combination to raise and fix prices of crude oil and automotive gasoline. The oil companies all firmly denied the charges.

•

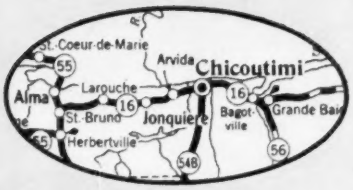
Also in the courts this week: Carter Products and Colgate-Palmolive, still feuding about their aerosol shave cream products. In U.S. district court at Baltimore, Carter is asking that the injunction granted against Colgate three years ago be broadened to further restrict Colgate's compounding of its soap solution and propellent. Colgate is trying to prove that its products do not come under the injunction.

•

Top-level chemical executives are higher paid than policy makers in other branches of U. S. industry. That's the finding of a just-completed survey by McKinsey & Co., New York management consultant firm.

McKinsey surveyed 71 companies in 16 industries, found "policy-making" chemical executives earn an average of $86,000/year, compared with $72,600 in the auto industry, $68,000 in petroleum, $64,500 in nonferrous metals, $53,000 in the rubber industry.

"Policy makers" were defined as the highest paid one-tenth of 1% of all personnel in a company with 20,000 or more employees.



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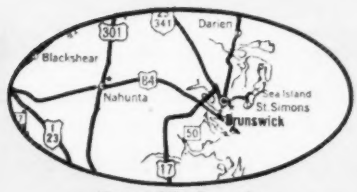

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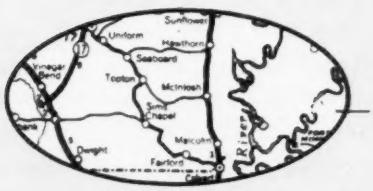

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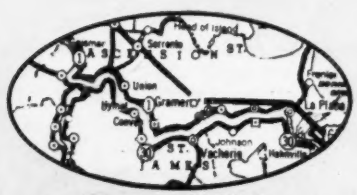

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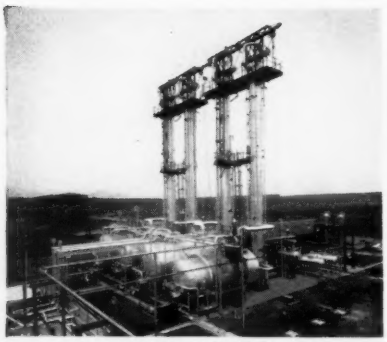
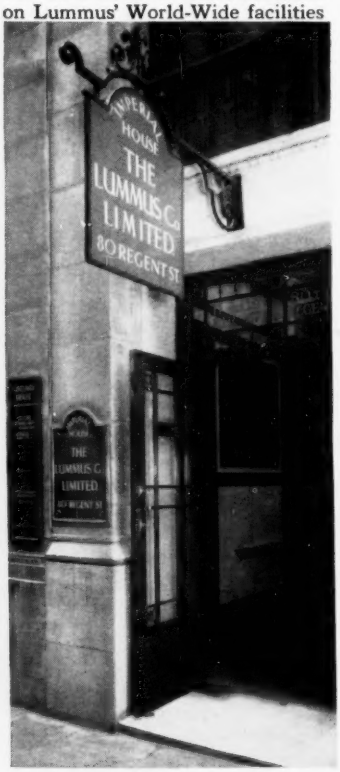


Benzole washing and distillation plant

One of a series of advertisements on Lummus' World-Wide facilities



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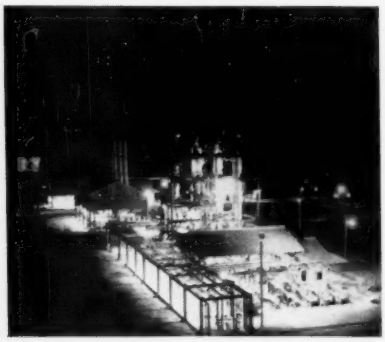

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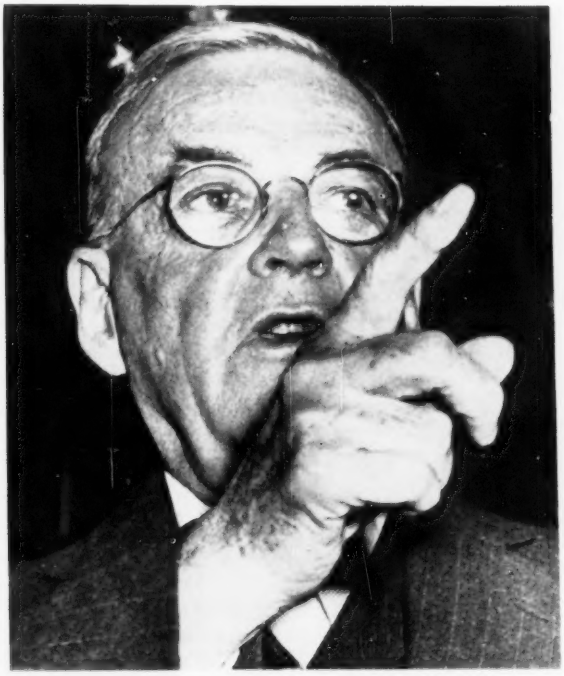
Chemical Week — June 7, 1958



WARY: Russia must get no strategic chemical assistance from the West.

WIDE WORLD PHOTOS

WOOER: Western chemical technology can help lick capitalism.

Process Equipment—New Political Pawn

In the U.S., England and West Germany this week, chemical and equipment producers are puzzling over Soviet Premier Nikita Khrushchev's recent sweeping offers of lucrative business deals, the vague and protracted "feelers" of Russian trade officials, and the cloudy trade policies of their own governments.

It all started last month when, in a speech before the Communist party's Central Committee, Khrushchev formally launched the chemical phase of his drive to conquer capitalism with higher productivity (*CW, May 24, p. 35*). Between 1958 and '65, Khrushchev asserted, chemical expansion will get a $25-billion boost.

"Artificial and synthetic fiber output" he decreed, "is to rise 4.6 times (estimated '57 output: 149,000 tons). Plastics and synthetic resin production will increase eightfold (no production figures are available). And production of synthetic rubber will rise 3.4 times ('55 production has been estimated at 350,000 metric tons, had been slated under the current five-year plan to hit 770,000 tons in '60)."

Other basic chemicals slated for a push: caustic soda (631,000 tons in '56), soda ash (1.6 million tons in '57) and sulfuric acid (4.6 million tons in '57). Production of all will be doubled.

To help win this phase of the Communist campaign, Khrushchev told the party heads, Russia is willing to accept technological aid from the capitalist nations of the West, especially the U.S., England and West Germany.

A few months before Khrushchev's speech, in fact, Russia had already sent out a chemical plant "shopping list" (*table, p. 14*) to equipment manufacturers in the three countries. It is estimated that the value of the proposed plants could reach $100 million.

But blocking many possible shipments of chemical plants to Russia are the Coordinating Committee (NATO nations and Japan) regulations governing sales of strategic goods to Iron Curtain countries. Most chemical equipment is on the forbidden list, and may remain even on the liberalized list that is expected to result from Cocom negotiations.

No Deals in U.S.: A *CW* survey of chemical engineering firms indicates that Russia is not yet seriously pushing its quest for U.S. equipment, though its trade missions are active in Europe.

In the U.S., chemical plants, equipment and technology traded with Russia must be licensed by the Commerce Dept.'s Office of International Trade, which is influenced by the State Dept.'s tough Communist-trade

policy line. In recent years, no licenses have been granted, although several producers have expressed interest.

U.S. restrictions have been even tougher than the Cocom rules. But there are signs of some easing.

The Commerce Dept. maintains the policy of neither encouraging nor discouraging sales of chemical plants and technology to Russia. Each case, it says, will be evaluated on its merits. So producers have no clear policy guidance.

If U.S. companies are excited over Khrushchev's offer, they are not talking about it. Despite the Commerce Dept. statement that the Russian shopping list had been sent to U.S. firms, none of the companies queried by *CW* reports receiving it.

Only two construction firms report any Russian overtures at all. Chemical Construction Co. was informally approached—through a Japanese intermediary—about designing and supervising construction of a plant to produce "two or three basic, fundamental plastics." This plant, Chemico says, would be twice the size of anything comparable in the U.S. The U.S. government o.k.'d the deal, but the Russians have not yet followed up with a concrete request.

Foster-Wheeler also received an indirect inquiry through a subsidiary, but that, too, remains in the air. And Du Pont reports vague and indirect queries about the possibilities of selling synthetic fiber processes, but no queries solid enough "to get your teeth into."

Most companies expressed mixed feelings about dealing with Russia. Public relations and customer repercussions, the lack of patent protection, the fear of helping Russia at the expense of the U.S. all give pause. Fluor refuses to do business with any Iron Curtain country, has already rejected Russian requests to build plants in Yugoslavia and Poland. Ralph M. Parsons Co., on the other hand, told *CW* it would be willing to submit a bid, provided it had government approval and the Russians would deposit money to cover the project.

Most firms, however, apparently have not given serious thought to trading with Russia because they have not been approached. When the time comes, most say, they will follow the government's lead regarding trade.

Down to Brass Tacks? But will the time to trade ever come? Despite Khrushchev's earnest statement about his desire for buying U.S. equipment, it appears that no firm offers have been made in the U.S. Amtorg, Russia's trading agent in the U.S., reports that, while several chemical and construction companies have recently expressed interest in selling to Russia, it has received no chemical equipment specifications or orders from the U.S.S.R.

Some observers feel that Khrushchev's overtures are primarily for political and propaganda purposes. Aroused U.S. businessmen could bring pressure on the State Dept. for an easier trade policy.

Matter of Intentions: The experiences of English and German chemical and engineering companies with the Russians shed further light on Soviet intentions.

Russian trade contact with West European companies has been picking up in recent months. In Germany, Russian interest in chemical equipment is keen. A technical and chemical delegation has been touring the Ruhr and Frankfort areas and will probably place at least $25 million in equipment orders as part of the three-year $750-million goods exchange agreement signed in April. Among reported purchases are equipment for a vegetable oil and fat extraction plant, a polyvinyl chloride diffusion-drying installation, a milk evaporation plant, other food and fiber industries equipment. Soviet interest centers on equipment for plastics, synthetic fibers and petrochemicals.

But Russian business tactics are trying the patience of the Germans. The usual Russian procedure is to request offers from five or six manufacturers, then play one off against the other. The Russians try to get detailed technical information along with the bids and general description, possibly indicating an intent to copy the process, even if the deal falls through.

And the Russians offer no license agreements. Equipment delivery includes sale of the process.

Russia's Chemical Plant Shopping List

PRODUCTS	CAPACITY
Titanium dioxide from titanium tetrachloride	20,000 tons/year
Rutile (for titanium dioxide)	not available
Di-isocyanates	5,000 tons/year
Polyethylene and polypropylene (single plant)	Polyethylene, 25,000-30,000 tons/year Polypropylene, 5,000-10,000 tons/year
Perlon molding powder (both soft and hard types)	1,000 tons/year
Acetylene from natural gas	50,000 tons/year
Polyurethane foam	3,000 tons/year
Caprolactam from aniline	10,000 tons/year
Phthalic anhydride	45,000 tons/year
Melamine from urea	10,000 tons/year
Polyvinylpyrrolidone	180 tons/year
Polyacrylonitrile	2,700 tons/year
Acrylonitrile (two plants)	2,900 tons/year each
Maleic anhydride	6,000 tons/year
Hexamethylenediamine from butadiene	5,000-10,000 tons/year
H_2C and H_2S*	70 tons/year

*McGraw-Hill World News (London Bureau) was unable to get the Russians to clarify this description.

Civil Suits Hit Citric, Dyes

Lawyers on Assistant Attorney General Victor Hansen's antitrust staff have been busy all year, but not until last month did their labors affect the chemical and drug industries. Last week — just two weeks after the indictment of five polio vaccine producers (CW Business Newsletter, May 17) — Hansen hurled civil antitrust suits at these producers of citric acid and dyestuffs:

• Pfizer is accused of using restraint-of-trade tactics to safeguard its position as No. 1 citric acid producer with about 90% of the U.S. market.

• U.S. branches of three Swiss dyestuff companies — Geigy, Ciba and Sandoz — and their jointly owned Toms River-Cincinnati Chemical Corp. are charged with conspiring to eliminate competition among themselves by fixing resale prices.

Quick Denials: Pfizer President John McKeen promptly issued a stout denial of Hansen's allegations. The dyestuff companies declined to comment until they could read the complaint.

Hansen levels four major charges at Pfizer:

(1) That it has contracts with some of its larger customers preventing them from buying citric acid elsewhere.

(2) That Pfizer has appointed several potential competitors as distributors and granted them discriminatory discounts on citric acid purchased for their own use.

(3) That Pfizer, as a condition of employment, compels its employees to sign contracts that prevent them from going to work for another manufacturer of citric acid for 10 years after leaving Pfizer.

(4) That Pfizer has contracts with Kemball, Bishop & Co. (London) dividing world markets between the two companies.

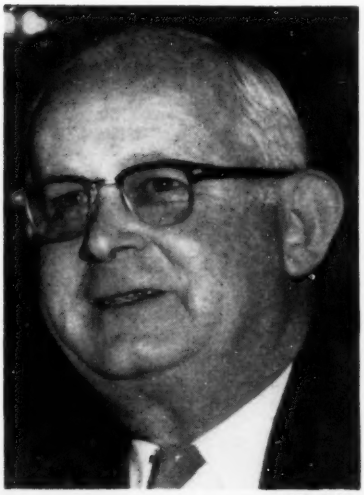
'No Preferential Discounts': In his strongly worded comment on the citric suit, McKeen criticizes the government for "taking steps to penalize scientific achievement." Says McKeen: "The company's distribution contracts require the distributors to pay the regular market price for material purchased for their own use — there are no preferential discounts. The company's agreements with employees and engineers working on citric acid contain the clauses customary in the industry to protect trade secrets. The company has no cartel or allocation agreements with any British company or anyone else." McKeen said the Pfizer process had lowered citric prices 75% since 1919.

The complaint against the dyestuff makers is somewhat less specific. The main charge is that the defendants devised a plan to maintain and stabilize the prices at which they purchase some dyestuffs from their affiliated subsidiary, Toms River Corp.

At press time, queries to the three dyestuff companies revealed that none had yet been served with a complaint.

Domestic dyestuff makers queried by *CW* don't feel the alleged price-fixing agreement could have much effect on the industry as a whole. Said one observer: "In this competitive industry, no three producers could set prices artifically high; customers would simply buy from others."

Both Pfizer and the dyestuff makers have 20 days from last week's filing date to formally answer charges. From then on, says McKeen, "We plan to defend vigorously the government action against us." Dyestuff makers are also expected to put up a stout legal battle.



WIDE WORLD

Antitruster Hansen: In three weeks, three new suits on chemical products.

Airco's Hill seeks to line up U.S. partners for PVA fiber venture.

New Entry in Fibers

In the biggest move of its 11-year chemical expansion and diversification program, Air Reduction is taking a $12-million plunge into the synthetic fibers business.

Airco's first steps will be to build a 20-million-lbs./year polyvinyl alcohol resin plant next to its present units at Calvert City, Ky., and a large pilot plant at Bound Brook, N.J. Both of these could be converted to production of vinylon, a synthetic fiber, developed and manufactured by Kurashiki Rayon Ltd. of Osaka, Japan.

Another phase of the project will involve doubling the capacity of Airco's 45-million-lbs./year vinyl acetate monomer plant at Calvert City. Object: to gain new capacity to supply the new polyvinyl alcohol plant (2 lbs. of vinyl acetate is needed for each pound of polyvinyl alcohol).

Onstream by '60: Construction will get underway this summer and all phases are scheduled for completion early in '60. Lummus Co. (New York) is the contractor.

Kurashiki, the major Japanese producer of vinylon, has licensed its resin and fiber process to Airco and has granted all U.S. sales and production rights to the U.S. firm. But Airco President John Hill reports he is actively seeking other partners to help develop the fiber markets in this country.

Versatile and Durable: Polyvinyl alcohol fiber reportedly can be made to look and feel like wool, silk or cotton, and its strength and heat resistance compare with those of nylon. Airco also praises the fiber's resistance to chemicals, solvents, sunlight and fungi.

Airco will convert the Calvert City plant fiber production as markets develop. However, it will still rely on standard polyvinyl alcohol outlets—e.g., adhesives, textile sizing and finishes and paper coatings for a substantial portion of sales.

The new PVA plant will be Airco's sixth major project at Calvert City and brings the company's total investment there to about $40 million. Other Calvert City units still abuilding include a vinyl stearate plant and a new installation for recovering residue materials from acetylene generation.

Florida Gas Line O.K.

Chemical industry buildup in Florida will finally get the added stimulus of natural gas for process use throughout the state, it appeared this week.

Having defeated the latest attempt to spike their Texas-to-Florida pipeline project, Coastal Transmission Corp. and Houston Texas Gas & Oil Corp. now are planning to start the $150-million construction job Aug. 1.

Their latest legal obstacle was cleared last fortnight when the U.S. Supreme Court turned a deaf ear to the plea by a group of Florida fuel oil distributors who oppose the pipeline project. This paved the way for starting construction of the five-state natural gas network that has been on the drawing boards for more than two years (*CW, April 6, '57, p. 24*).

Coastal will transport gas from Texas and Louisiana fields to Baton Rouge, La. From there, the gas will be moved to peninsular Florida by Houston Texas Gas & Oil. About 1,000 miles of main pipe and 500 miles of lateral pipe will be used to deliver up to 240 million cu.ft./day to some 47 Florida communities and industries — including several chemical plants. Up to now, only the northwestern corner of Florida has had natural gas.

Financing will come from new issues of common stock and debentures by Houston Corp., parent firm.

Wood-Urea Coming Back

Executives of Allied Chemical's newly formed Plastics and Coal Chemicals Division are getting off to a bold start as they open the country's only wood-filled urea plant next month.

Wood-filled urea — urea formaldehyde molding compounds that use wood flour in place of alpha-cellulose as the filler — hasn't been produced in the U.S. since American Cyanamid shelved its project in April '57. Allied, too, formerly turned out wood-filler urea, due to the short supply of phenolics and alpha-cellulose during World War II, but it ended production in '54. Both firms stopped producing because of "unsatisfactory profit margins and limited markets."

But now, marketing executives H. W. De Vore and R. K. White, of Allied's new division, will concentrate on developing a specialized market for this upgraded, all-colors wood-filled urea, a product that will be directly competitive with the solidly established phenolic and alpha-cellulose molding powders.

The Market: The revived, improved product is aimed at two markets for thermosetting plastics — wiring devices and bottle tops — totaling 64 million lbs./year. Whiting Shepard, sales manager of Allied's molding compounds, told *CW* the maximum potential for wood-filled urea in '59 will be about half this amount — 30 million lbs. Plant capacity (at Edgewater, N.J.) is set at 24-36 million lbs./year.

Prime advantages claimed for wood-filled urea over other powders: lower cost; improved electrical properties, particularly high arc-resistance; colorfastness, causes less mold wear, and produces moldings that are more scratch-resistant.

Tough Selling Ahead: In spite of its apparent selling points, the compound will present a tough marketing job. It has a lower tag than urea-and-alpha-cellulose, but two of the largest molded-closure users — the pharmaceutical and cosmetic companies — are likely to continue to demand white and ivory bottle tops. And this demand can't yet be met with wood-filled ureas. Another obstacle: most electrical-parts molders are satisfied with the performance of phenolics.

There's this, too: if the new division succeeds in opening up the market for wood-filled urea, other makers of molding resins will be clamoring to get in. Cyanamid, for one, reports that it is still interested.

Allied's DeVore and White map sales drive for wood-filled urea.

EXPANSION

Pulp and Paper: In western Canada, two pulp and paper projects were in the news last week:

- At Edmonton, Alberta West Forest Products Ltd. will soon call for bids for construction of a $15-million, 300-ton/day pulp and newsprint mill. Construction is expected to start this summer.
- At Saskatoon, the Saskatchewan provincial government has granted a 60-day extension of the option of Ellis E. Patterson and Associates (Studio City, Calif.), which has been planning to build a pulpmill and develop 12,000 acres of timberland in northern Saskatchewan. The company reportedly is having difficulty arranging the financing.

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Radiochemicals: Research Specialties Co. is building a $275,000 plant at Richmond, Calif., to produce radiochemicals and research instruments.

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Hydrogen Sulfide: Freeport Sulphur Co.'s Cuban American Nickel Co. Division has authorized Girdler Construction Division of Chemetron Corp. to engineer and equip a hydrogen sulfide generating unit for Cuban American nickel and cobalt producing facilities at Port Nickel, La. The hydrogen sulfide will be used to refine nickel and cobalt sulfides shipped from Cuba.

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Lime Products: U.S. Lime Products Corp. has opened a $2-million manufacturing plant at Arrolime, Nev., 19 miles northeast of Las Vegas. The calcining plant —with capacity of more than 400 tons/day—will supply various lime products to the metallurgical, paper, chemical and construction users throughout the West. The company is a subsidiary of The Flintkote Co. (New York).

COMPANIES

Hooker Chemical Corp.—the new name was approved by stockholders last week—has started a program of decentralization. First step: putting the Durez Plastics Division on a relatively autonomous operating basis, with its management now responsible for production, sales and profits. Hooker President Thomas Moffitt explains that since the company has nearly tripled in size since '55, "decentralization is considered advisable to achieve maximum efficiency. . . ."

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The Glidden Co. is taking over most domestic assets of General Paint Corp. (San Francisco), after approval by General Paint stockholders. The cash transaction involves General Paint's processes, brandnames, Far Western distribution outlets, inventories, accounts receivable, and manufacturing plants in Portland, Ore., and Tulsa, Okla. Excluded from the purchase: the paint plant in San Francisco, which was leased; foreign paintmaking subsidiaries in Mexico and the Philippines; and the Hill, Hubbell and Co. pipe wrapping and coating division (Cleveland).

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American-Saint Gobain Corp. formally came into existence last week through merger of two wholly owned U.S. subsidiaries of France's far-flung glass and chemical combine, Saint Gobain (Paris). The new company will produce flat-glass products, plans to supplement its facilities by constructing a new plate glass plant. Merged were American Window Glass Co. (Pittsburgh) and Blue Ridge Glass (Kingsport, Tenn.).

•

Otto B. May, Inc. (Newark, N.J.), producer of textile chemicals and dyestuffs, is now affiliated with a major producer of cotton textiles. Controlling interest in it was acquired last week by Cone Mills Corp. (Greensboro, N.C.). Ernest May will continue as president of the chemical firm.

FOREIGN

Formaldehyde/Italy: Montecatini Mining & Chemical (Milan) is building a third formaldehyde unit at Catellanza. This $300,000 plant—said to be so nearly automatic that it will require only one attendant per shift—will raise the company's formaldehyde output at Catellanza from 80 million to 135 million lbs./year.

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Caustic Soda/Colombia: Banco de la Republica is building a $1.9-million caustic-chlorine plant that's expected to make Colombia self-sufficient in rayon-grade soda. The plant —at Zipaquira (near Bogota)—is due onstream this September, will have daily capacity of 40 tons of caustic, 35 tons of chlorine and 5 tons of hydrochloric acid.

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Cellulose/Rumania: Four Communist countries—Rumania, East Germany, Czechoslovakia and Poland—are cooperating in construction of a cellulose plant at Braila, Rumania. Eventual capacity: 100,000 tons/year. By-products will include textile fibers, paper, fodder yeast and chemicals.

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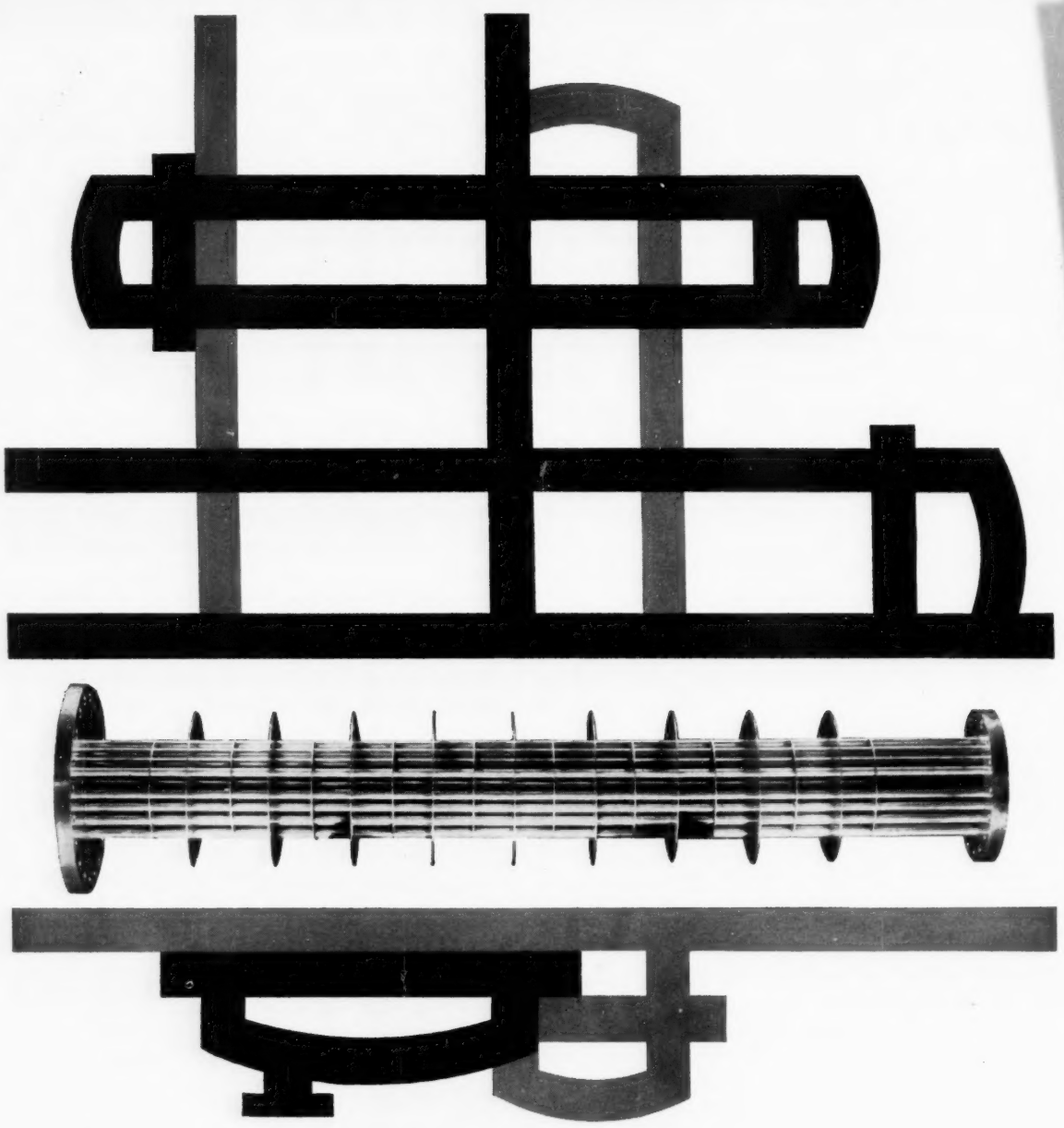
Chlorine/Mexico: Pennsalt Chemicals' Mexican subsidiary, Industria Quimica Pennsalt, S.A. de C.V., has opened its $3.2-million caustic-chlorine plant northeast of Mexico City. Using the mercury cell process of Oronzio de Nora (Milan, Italy), the plant can produce 40 tons/day of rayon-grade caustic, 35 tons/day of chlorine, plus sodium hypochlorite and hydrochloric acid. Pennsalt estimates that the new plant will meet Mexico's current needs, thus cutting off imports valued at $1.6 million/year.



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Washington
Newsletter

CHEMICAL WEEK
June 7, 1958

It's time to take another look at Congress. Leaders are aiming for an Aug.10 adjournment, so they are beginning to think of what must be done before then.

This means that bills that haven't yet been subject to public hearings stand almost no chance of being voted. In this group are most of the pending proposals to tighten food, drug and cosmetics controls, as well as some broader policy matters that will make an impact on one or more branches of the chemical process industries.

Here's a rundown on the 85th Congress's record:

The House has completed action on nearly all appropriation bills and the Senate has wound up committee hearings on them. The Administration will have more money for defense—missiles and research. Foreign aid funds, which account for an estimated 11,000 jobs in chemical and related industries, will total some $3.6 billion, about what Eisenhower requested. Money for medical research and food and drug enforcement will hold to last year's levels, but there will be slightly more for water and air pollution research. There's also a good chance that Congress will come through with the additional funds that Interior Secy. Fred Seaton recently requested for research on getting fresh water from salt water.

Don't completely rule out a chemical additives bill this year. Chances of final approval are slim, but some observers feel that a bill could possibly slide through in the end-of-session rush. They see it happening this way: if a bill is approved by the House Commerce Committee—a real probability—it's a foregone conclusion that such foes of chemicals-in-food as Representatives Sullivan (D., Mo.) and Burdick (R., N.D.) will apply pressure to bring it to a vote by the full House, raising their familiar cry—"Are you for or against cancer?" If that tactic succeeds once, it could be used again to bring off Senate passage, without first sending the bill to a Senate committee for hearings.

Manufacturers and industrial users of additives fear this possibility—largely because of the emotional undercurrent surrounding the additives question and the lack of knowledge of most congressmen about the pros and cons of the chemicals-in-food safety issue.

Agricultural research spending will continue its steady climb. But the big push programed for utilization research (converting farm crops into industrial products) is being put off until fiscal '60. This year's program will place heavy stress on crop disease research.

Taxes will be extended another year—definitely the corporate rate of 52% and the Korean War excises—to June 30, '59. Prospects of a general tax cut benefiting individuals are virtually nil. Eisenhower last week came out against all cuts, except relief for small business.

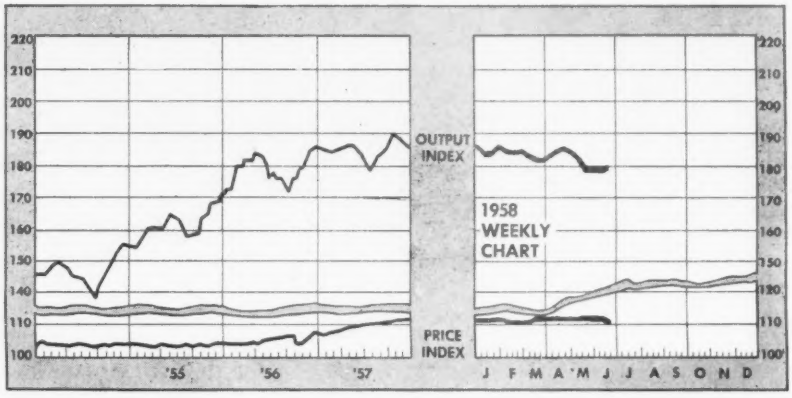
Washington Newsletter

(Continued)

On reciprocal trade extension, the Administration will get most of what it wants. Prospects are that the House will o.k. a five-year extension with authority to make gradual, selective tariff cuts, but the Administration will have to take a tightening of the escape clause as the price. The big fight will come later in the Senate, where the high-tariff advocates have won most of their points in previous Congresses.

"Fair trade" may make some headway this year. The House Interstate Commerce Committee may vote out the bill—heavily backed by retail druggists—restoring the right of manufacturers and retailers to agree nationwide on resale prices. The bill will be a big issue in next year's Congress; time and the recession are against final action now.

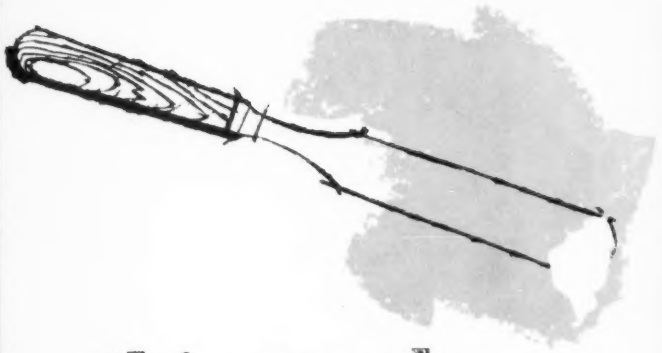
Premerger notification, union welfare fund disclosure and curbs on union leaders are bogged down in controversy and won't be enacted this year. But Congress will o.k. two atomic bills—a federal reactor construction program and authority to share atom secrets with U.S. allies. There's a good chance, too, that Congress will pass a bill, approved by the Senate Banking Committee last week, providing up to $250 million in Small Business Administration underwriting of public or private investment groups to put equity into small firms. Eisenhower's plan to extend unemployment compensation will be enacted.



Business Indicators

WEEKLY	Latest Week	Preceding Week	Year Ago
Chemical Week output index (1947-49=100)	180.0	179.5	185.0
Chemical Week wholesale price index (1947=100)	110.8	111.0	110.1
Stock price index of 11 chemical companies (Standard & Poor's Corp.)	38.96	38.66	45.32

MONTHLY Production (Index 1947-49=100)	Latest Month	Preceding Month	Year Ago
All manufacturing and mining	127	130	145
All chemical products	179	181	184
Industrial chemicals	193	194	206



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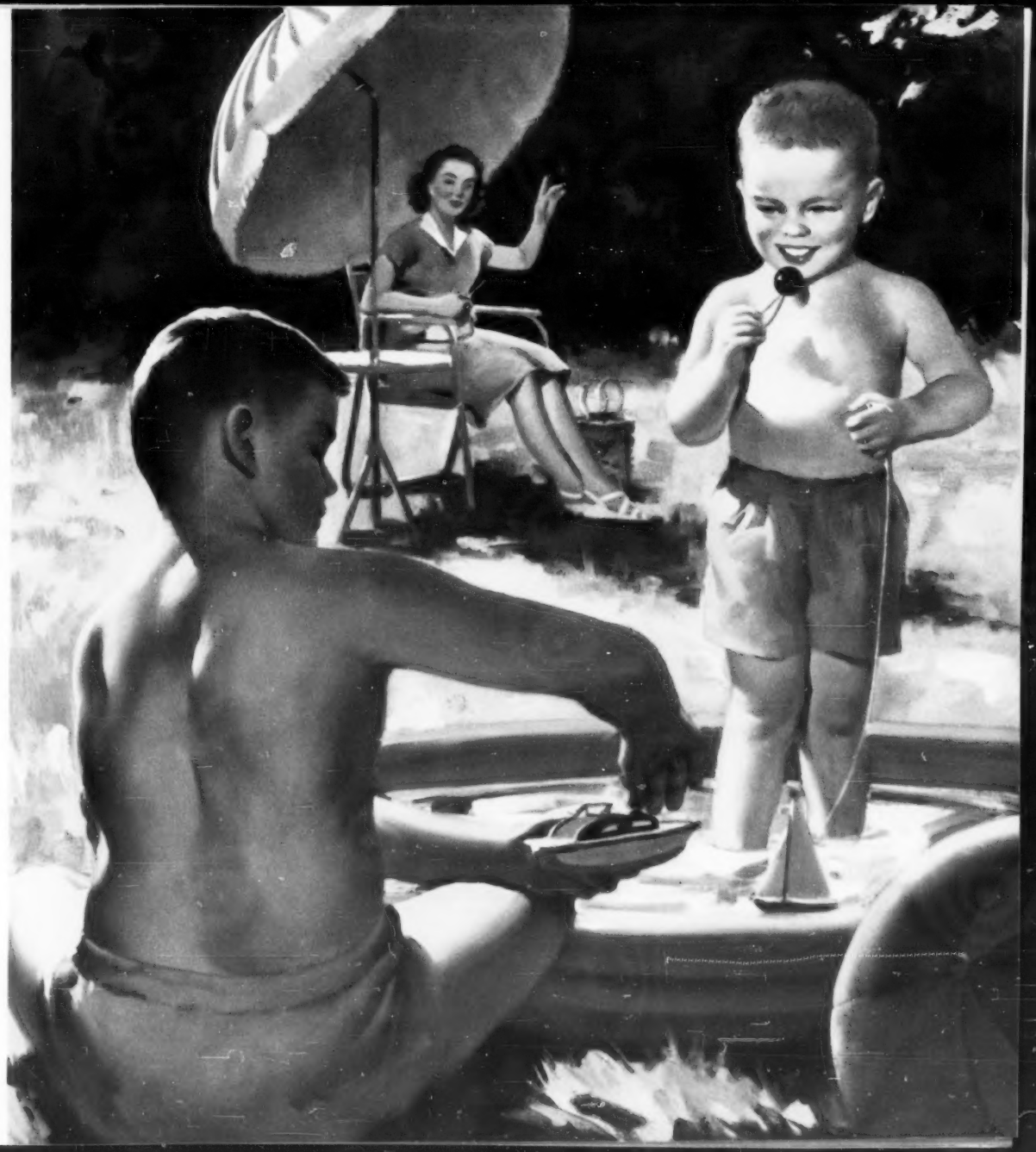

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Discussion-leader Katz helps Puritan's management and wives aim at new concepts of problem-solving.

Management Takes the Philosopher's Road

A new approach to creative management is capturing imaginations at Puritan Chemical Co. in Atlanta, Ga. It's a direct application of the philosopher's much-talked-about — though seldom acted on — principle of developing the "whole man."

Objective of this philosophic approach is to liberalize a man's thinking and to free his imagination from routine problem-solving. And though it may sound high-flown, Puritan thinks that already several completely new concepts relating to the company's business management can be traced to the program.

Basically, the program is a series of discussion meetings for management and members of their families, directed toward giving them greater knowledge of the liberal arts. The meetings are conducted by an acknowledged philosopher and artist. Rather than helping participants reorder old concepts in dealing with their problems — whatever they may be — the course teaches them to seek new concepts.

How It Began: Puritan's study series, "Towards Creative Thinking," evolved from lectures Puritan President Ted Fisher attended in 1956. In these, Fisher and his wife and a number of artists carried on informal philosophical discussions under the direction of Leo Katz, an Austrian artist-philosopher.

Katz caught Fisher's special attention when he tossed out the idea that Americans' mania for thinking in terms of application — coupled with habitual competitive thinking — has nurtured a nation of appliers who must import basic ideas. Says Katz, "The enthusiasm for utilitarian and pragmatic thinking has become so great that it is now a dogma of extreme exclusiveness — any thinking that does not result in immediate profit is considered a waste of time."

To Fisher this criticism of short-

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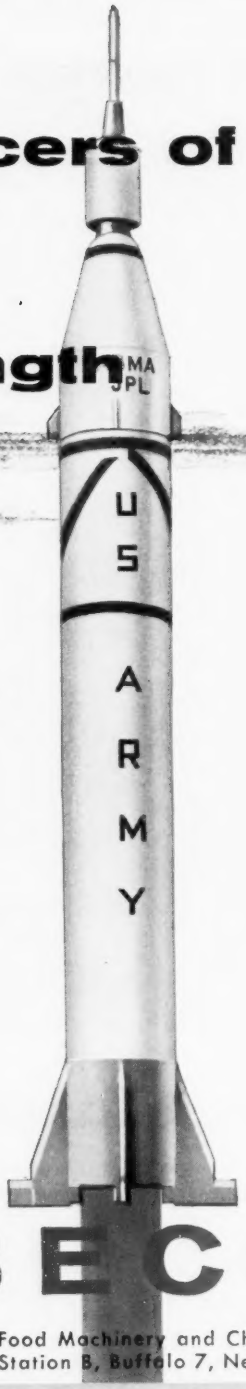

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sighted thinking made sense, and he began toying with the idea that this same weakness applied to present-day business attitudes. Why, he asked, wouldn't it be wise to take a more ideational approach to business, with emphasis on long-term ideas and creativity, rather than on the need for immediate application? After convincing Puritan's Production Vice-President Bill Frye that this would be a progressive step for the company (which ranks among the top five of the country's sanitary-supply makers), Fisher and Frye met with Katz to determine what steps might be taken.

With Katz's help—he has taught and has exhibited work in many of the country's outstanding art centers, has been artist-in-residence to the Hapsburg family, and lectures for the Whitney Foundation at Atlanta's Spelman College — Fisher and Frye agreed on a series of Monday night discussions that would have no preconceived direction or subject. No formalized course was laid out, since the purpose was to create an atmosphere "friendly to new ideas."

Now, after a year of activity, the group's zeal has grown surprisingly. The young executives (average age under 40) and their wives gladly take on weekly baby-sitter expenses to attend the dinner and discussion meetings. Meetings are often held in the plant's cafeteria, usually the most convenient for all concerned.

Topic Range: Topics range from the great religious leaders and philosophers to Einstein's theory of relativity. For example, the group recently expressed a desire to learn more about past cultures that have contributed to many of our present concepts.

For several sessions, they've discussed ancient Egypt, with emphasis on "empathetic" consideration of ancient Egyptian life. They've taken a few simple facts (such as Egyptian dependence on the Nile, and the country's location in equatorial climate) and from these they have evolved a hypothetical culture. Later, they'll compare their thinking with what is known to be the course of Egyptian culture.

Crux of the theories Katz expounds: mental approaches and intellectual habits acquired through our education system represent serious limitations to thought, which are re-

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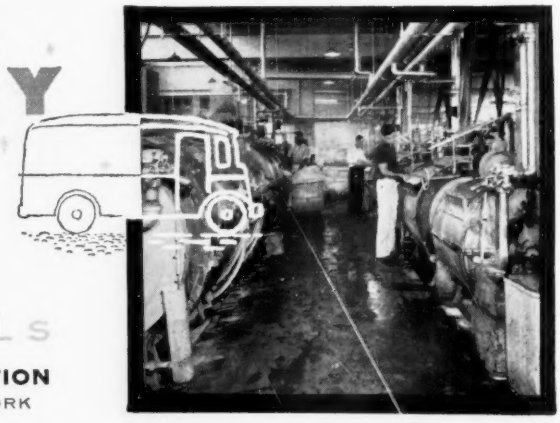

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ADMINISTRATION

flected even in our business and political lives. "People otherwise quite brilliant have lost the ability to ask straight questions and to answer questions in a straight way," he says.

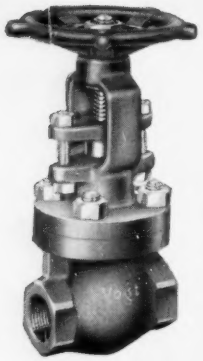
Fisher feels that his experiment is more subtle than conventional brainstorming, in eliciting solutions of problems, because brainstorming tends to seek an answer to a single, well-defined problem and is in no way a basic approach to problem-solving: "We feel a need to become more creatively inclined — to give our subconscious a chance to grow."

No Immediate Goal: Fisher stresses that the series isn't being undertaken specifically to boost Puritan's profits. Nevertheless, he feels, the creative climate produced has led to several new ideas. Among these was the development of a whole new concept of packaging. Under it, he says, "many products were affected, not just one. We also have adopted a brand-new approach to merchandising and formulating products. For example, tables of product characteristics have been developed and by use of them we have discovered that in some cases two or more products could be combined in a single, more salable, item."

To critics who hint that the program is molding families into a company pattern, Fisher has this answer: "What we're attempting has no more to do with making Puritan the center of their lives than would awarding scholarships to their children. The fact that we already have something in common — our mutual business efforts—adds to the stimulus that would be forthcoming from any group where the individuals are turning every thought toward one goal."

This search for creativity is centered on three points Katz has proposed to the group: use of creative imagination; understanding through empathy; and avoidance of what he terms "dimensional deficiency in thinking." The latter he characterizes as the tendency to make sweeping judgments without showing the background against which they are valid.

Says Fisher: the bigger the company and the more diversified its activities, the more valuable this basic approach to management would be. "A reduction in empirical efforts is a boon to any company, but the large organization stands to gain the most by cutting them."



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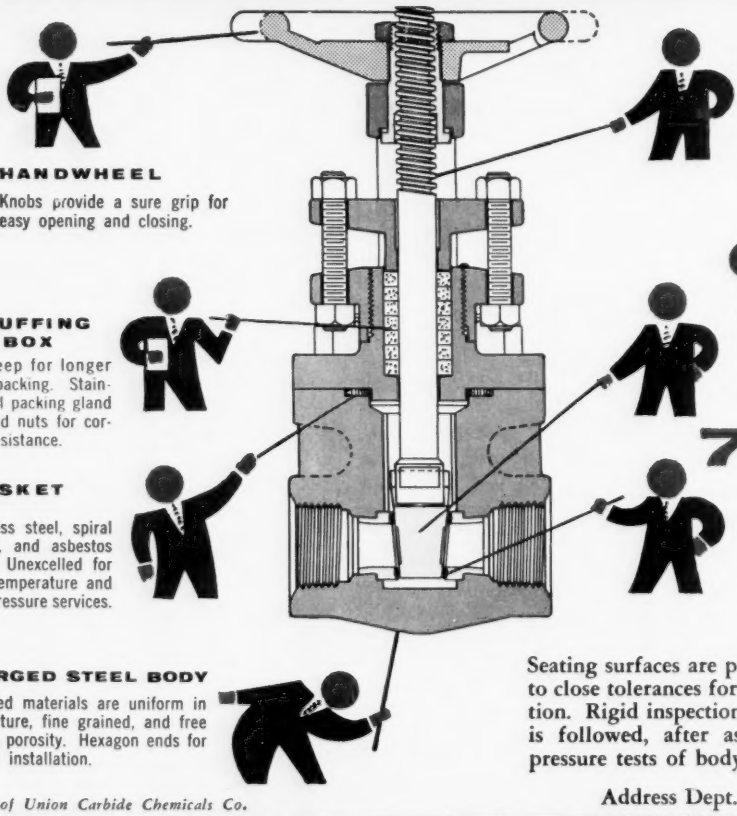

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No Wage Hike: Vanadium Corp. of America and Local 12067, District 50, United Mine Workers of America, have renewed the labor agreement that expired late in May. Included in the renewal is a provision for a reopener in May '59 for discussion of basic wage rates. The new contract includes recognition of Washington's birthday as a holiday and an increase in holiday pay. Other provisions: liberalization of life insurance benefits and adjustments in seniority and other administrative provisions.

•

Kentucky Merger: The Kentucky State Federation of Labor and the state Congress of Industrial Organizations Council have agreed on merger terms that could lead to a 100,000-member labor body in Kentucky. KSFL has some 62,000 members; the CIO group has about 35,000. Merger has been held up for several years pending decision of which group would provide the first president of the new organization. Details of the agreement have not been announced.

LEGAL

More FTC Charges: Two recent legal actions underscore the view that there's no letup in sight from the Federal Trade Commission's prosecution of alleged violators (price discrimination or false advertising) of the Clayton or FTC acts.

The commission has charged Southern Oxygen Co. (Bladensburg, Md.) with price discrimination in violation of section 2 (a) of the amended Clayton Act and has ordered the company to stop selling compressed gases to different purchasers at different prices.

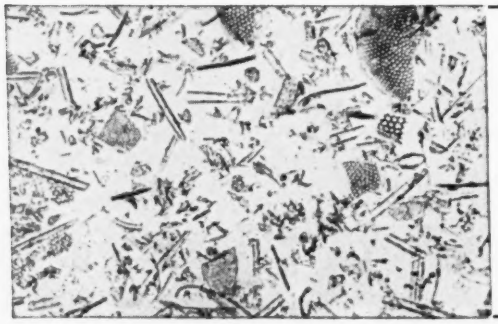
The company is also ordered not to discriminate among purchasers in extending terms or rates for cylinder use. The commission's order applies only to sales or rentals in which Southern is in competition with other sellers. It isn't intended to prohibit the company from differentiating between customers in different trade areas, as long as the price doesn't undercut a competitor's price.

FTC also charged Timed Energy—a New York partnership of James E. True, Charles H. Ruby, Patricia M. Gallehr and Leon Weiss—with misrepresenting its Vita-Timed capsules

What have these "warriors' shields" got to do with better product performance?

Among the hundreds of different types of particles found in Celite diatomaceous earth are these "warriors' shields." Shown here magnified hundreds of times, are, from left to right, *Navicula splendida, Raphoneis amphiceros* and *Navicula lyra.*

They're particles of CELITE that adds strength-



Celite's unique diatomite structure is shown in this photomicrograph. The infinite variety of particle shapes and sizes gives Celite its exceptional performance characteristics in a wide range of process applications.

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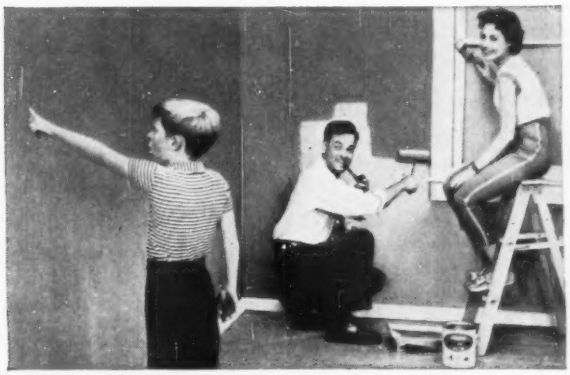
Adds strength to molded plastics. The harder grades of Celite impart high impact strength to many plastic products. Celite fillers also provide a more attractive surface finish and greater resistance to heat and moisture.



Controls gloss in paints. When included in paint formulations, irregular Celite particles protrude through the surface, diffusing light and providing a highly desirable flat appearance. Celite's high oil absorption also provides viscosity control for the finishes industry.

-the diatomite mineral filler soaks up dirt–controls gloss

THE structure of the individual diatom particle is the key to the success achieved by Celite* diatomite in so many process applications.

It requires 40 million whole or fragmentary particles to form a cubic inch of crude Celite. Consequently, even when added in small proportions, their properties are greatly magnified and widely dispersed throughout a formulation.

Relatively hard and irregularly shaped, particle contact is mainly limited to protruding outer points. Therefore, Celite won't pack down and has an extremely low apparent bulk density of 10 lb/cu ft. This explains Celite's high bulking action, excellent suspendability, and large particle surface area.

This same limited particle contact means that 93% of a given volume of Celite is composed of air pockets or voids. And, since the particles themselves are porous and cellular in structure, Celite can absorb more than twice its weight of liquid before reaching its limit.

Celite is produced from the world's purest source of commercially available diatomaceous silica at Lompoc, California. Celite comes in a wide range of grades . . . each carefully controlled for complete uniformity.

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(vitamin and mineral preparations) by saying they are safeguards against many degenerative diseases.

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Hearing before an FTC examiner is set for June 26 in Washington, D.C.

KEY CHANGES

Edward D. Hanagan to controller, Oakite Products (New York).

William H. O'Brien to director, Shulton, Inc., (New York).

Charles R. Lindsay, III, to director and vice-president, American Potash & Chemical Corp. (New York).

William P. Boyer to general manager, Chemical Division, Virginia-Carolina Chemical Corp. (Richmond).

Ralph T. Urich to vice-president—general sales manager, and **Herbert L. Wampner** to director of research, Reichhold Chemicals (White Plains, N.Y.).

Thomas M. Ware to president; **Louis Ware** to board chairman and chief executive officer; and **John D. Zigler** to general manager, Plant Food Division; International Minerals & Chemical Corp. (Chicago).

Frank J. Pizzitola to general manager, Chemicals Division, Olin Mathieson International Corp. (New York).

E. F. Liebrecht to president, Kellogg International Corp., subsidiary of M. W. Kellogg Co. (New York).

Ralph S. Binns to vice-president, Carlisle Chemical Works (Reading, O).

Frank R. Milliken and **Carl K. Lenz** to directors, Kennecott Copper Corp. (New York).

H. Dorn Stewart to president, Barrett Division; and **T. J. Kinsella** to president, newly formed Plastics and Coal Chemicals Division; Allied Chemical Corp.

Research and Development Costs, by Industry, 1953 and 1956

(Dollar figures in millions)

Industry	1953	1956	Percent increase
TOTAL INDUSTRIES[1]	3,664.4	6,452.7	76.1
Food and kindred products	54.2	75.9	40.0
Paper and allied products	27.9	39.6	41.9
Chemicals and allied products	361.1	511.7	41.7
Petroleum products and extraction[2]	145.9	250.3	71.6
Rubber products	53.6	82.4	53.7
Stone, clay and glass products	38.0	65.8	73.2
Primary metal industry	59.8	87.9	47.0
Fabricated metal products and ordnance	103.3	175.7	70.1
Machinery	318.9	610.6	91.5
Electrical equipment	743.3	1,173.4	57.9
Aircraft and parts	758.0	2,078.7	174.2
Professional and scientific instruments	171.7	272.5	58.7
Telecommunications and broadcasting	113.0	857.1	51.4
All other industries[3]	715.7	171.1	19.8

[1]Totals are calculated on the basis of all significant digits and therefore may not correspond exactly with those indicated by the rounded figures shown.

[2]Includes a few companies with relatively small research programs engaged primarily in manufacturing coal products.

[3]Includes the motor vehicle industry, for which available data did not permit computation of separate estimates, textile mill products and apparel, tobacco, lumber and wood products, furniture and fixtures, printing and publishing, leather, transportation equipment (other than aircraft and motor vehicles), transportation and public utilities, construction, and miscellaneous industries.

NSF Sizes Up Research

This week, National Science Foundation is mulling a new assignment—assessing the quality of the nation's industrial research and development programs. During its eight-year existence, NSF has been tackling the long-overdue job of measuring the quantity of this effort, a task that has resulted in the survey data (above) and a similar tabulation for the year '53 (CW, Jan. 14, '56, p. 40).

A recent NSF-sponsored meeting, at Washington's Shoreham Hotel, marked the first step in the new direction. The meeting, which brought together 500 leading businessmen, economists, scientists and educators, was called to ascertain what industry's dollars are doing to—and for—the economy. It brought out at least one salient fact: that monitoring research quality won't be easy.

As do several others who spoke at the conference, Ralph Burgess, chief economist for American Cyanamid, feels that "industry lacks the tools for measuring the adequacy of its research and development effort, particularly in basic research. His suggestion: "If we and others are to extend

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our venture into basic research, we need to have some goals toward which to strive; goals that will clarify our nation's needs and provide a general scientific framework into which we may fit ourselves without doing violence to any of our primary reasons for being in business." He feels that "assistance in the crystallization of these goals may lie in the province of NSF."

Burgess points out that characteristics that distinguish the chemical industry from others are its great expenditure for research and its large number of successes. Chemical research expenditures have resulted in a growth rate that doubles every 12 years.

Despite this achievement, he believes that chemical management might well do better if it had improved economic tools for planning research budgets. Budgets are now set pretty much according to what competition is doing. Once such tools are available, increased knowledge at the administration level should reduce the risk of research investment, thereby make it as important as, or possibly more important than, plant expansion, patent purchases, etc., Burgess says.

Don't Cry Uncle: Burgess applauded the chemical industry's high rank among research-minded industries, also cited that among the leaders of research spending it relies very little on government funds. Both factors are borne out by the new NSF report: total industrial R&D costs moved up 76% in '56 (to $6.5 billion) from the '53 total of $3.7 billion. However, the federal government's contribution to this budget increased from 37% to 49% in the same three-year period.

In the chemical and allied products industries, the government picked up the tab for only $13.3 million (2.6% of the industries' costs in '56). And in '53, the government's share was 2.5% ($8.9 million).

Controls Coming? Burgess cautions against creating an "imbalance between our social and our scientific knowledge. We don't want to see even basic research fall to the authority and responsibility of the government. "But it may be," he concedes, "that we must look to the combined genius of our scientific advisors in government, in universities and in in-

dustry for some fundamental research.

"Together, the constant sizing up of quantity and quality of research progress should provide data to help policy makers in both government and industry provide enough of the right kinds of research and development to assure future economic growth."

EXPANSION

• Aeronutronic Systems Inc. (Los Angeles) is building a new aerothermochemical laboratory at Newport Beach, Calif., for studies of the effect of sound waves on chemical reaction rates.

• Associated Midwest Universities (Argonne National Laboratories, Lemont, Ill.) is a new nonprofit research group formed by 26 universities, research institutes in the Midwest, and AEC. They plan to "create a reservoir of scientific manpower, knowledge and facilities," will work on nuclear reactor design, and cancer problems, among others.

• Bristol Laboratories, Inc., will build a four-story addition to its research facilities at Syracuse, N. Y.

• Geigy Chemical Corp. has completed new entomological research and chemical analysis laboratories at Ardsley, N. Y., for testing fabrics treated with its Mitin mothproofing.

• Victor Chemical Works is starting construction of a new research laboratory in Chicago Heights, Ill. Completion is scheduled for early '59.

REPORTS

The following Atomic Energy Commission reports are available from the Office of Technical Services, U.S. Dept. of Commerce, Washington 25, D.C.:

• The Use of Amines as Extractants for Thorium and Uranium from Sulfuric Acid Digests of Monazite Sands (ORNL-1859, $1); Standard Operating Procedure for Zinc Chloride Processing for Use in Thorium Production, Section 2,3,5,9 (FMPC-165 Revision 1, 50¢); Decontamination of Stainless Steel (ANL-4970, 50¢); Gamma Damage to Ethylene Glycol in MTR 90-Day Cooled-Fuel-Element Shipment (IDO-16441, 50¢); The Effect of Reactor Irradiation at Temperatures between 400 and 700 C on the Thermal Conductivity of Graphite (NAA-SR-1520, $1).

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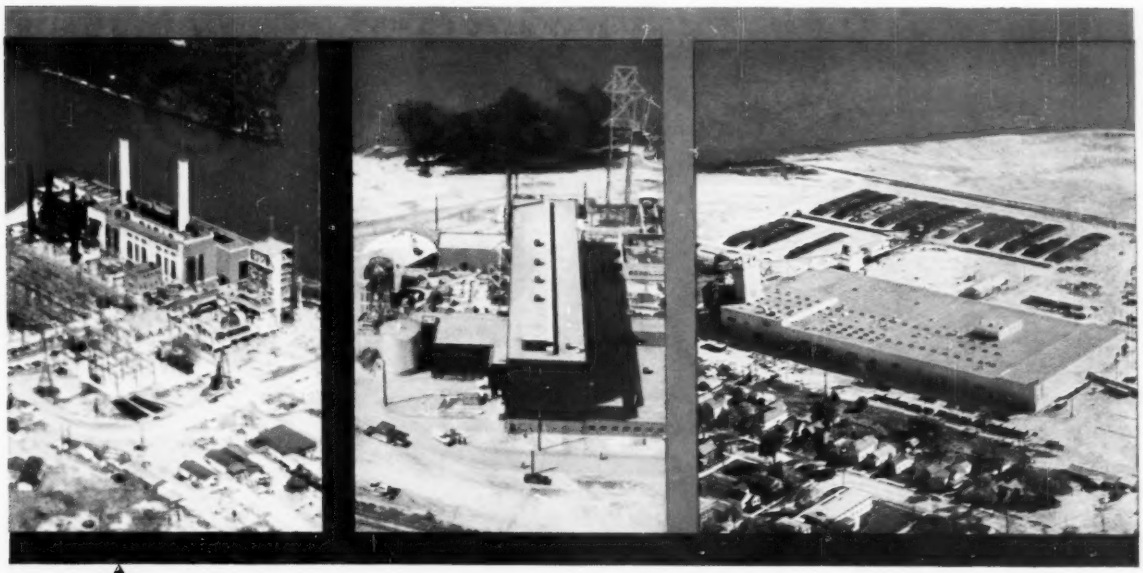

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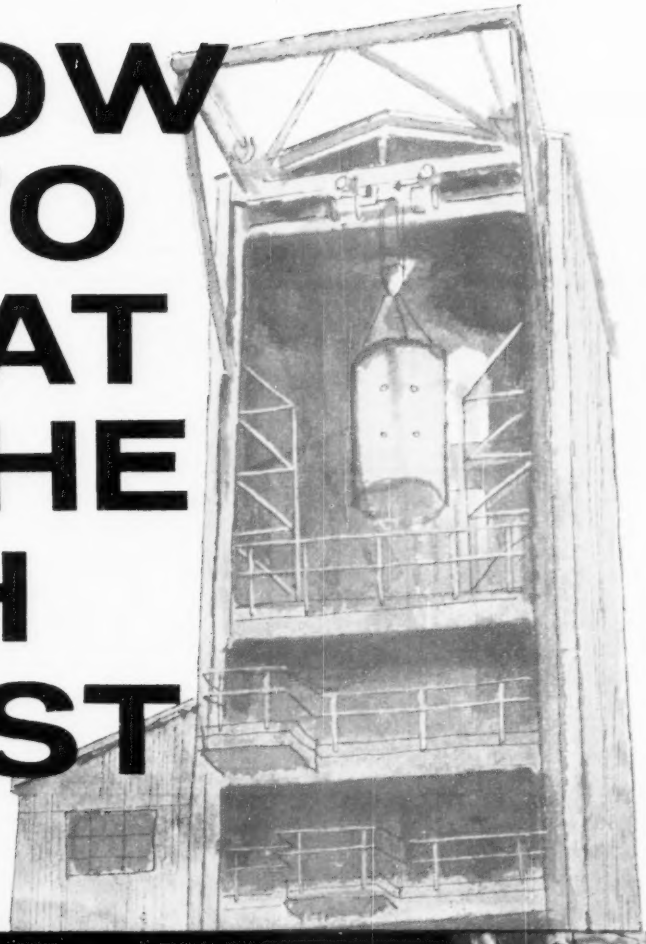
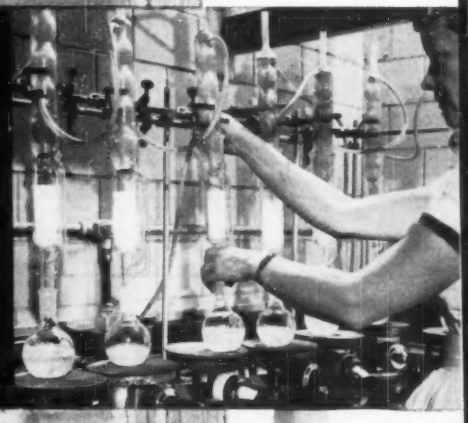
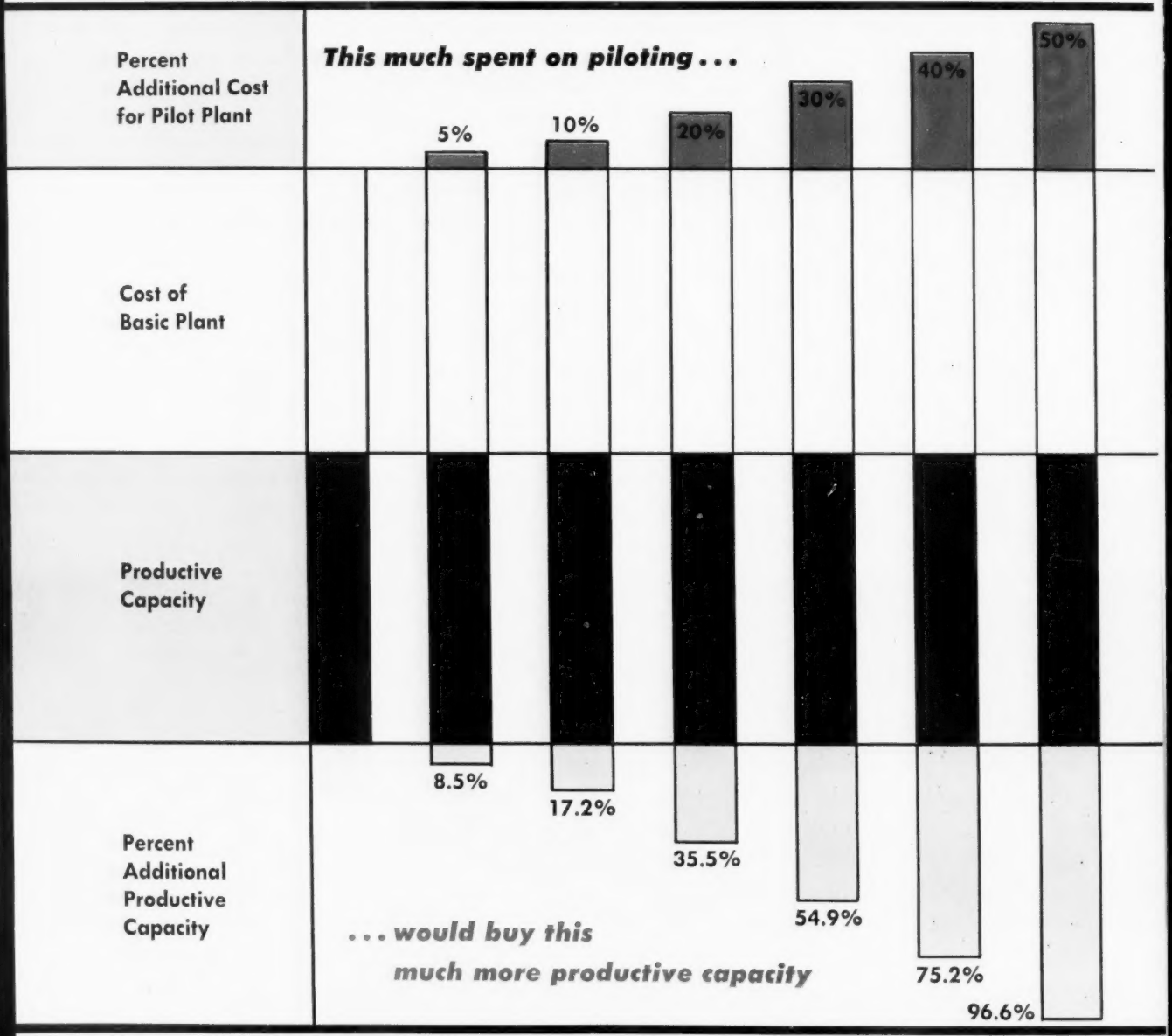




Big pilots are giving way to glassware; integrated units to multipurpose facilities. Better economic evaluation, more emphasis on timing and reuse of equipment are other trends as industry squeezes more value from its pilot-plant dollars.

If Money Spent on Pilot Planting Were Instead Invested in Production—



As piloting costs approach 30% of the cost of the proposed commercial plant, the decision to pilot should be critically weighed against the extra productive capacity the same money would buy.

Piloting: 'Isn't There a Cheaper Way?'

In a fair-size chemical firm last week, a top official hopefully opened a report on a promising new project. Before he finished reading it, his smile of satisfaction gave way to a shudder.

The laboratory had uncovered an interesting new intermediate and had worked up a process that promised that it could be made at an attractive figure. The sales department was sure the product would sell. So far, research costs had come to just under $130,000. All signs pointed to a handsome return on the proposed capital investment of $11 million.

This was to the good. What disturbed the executive was the request for an immediate $1.5 million for piloting the process and making samples for market development. His question—"Isn't there a cheaper way of doing this?"—is on the lips of finance executives all over the country. And their counterparts in research and engineering are trying to find the answer.

Multimillion-Dollar Link: The plain fact is that pilot plants are often the necessary link in the bench-to-plant commercialization chain. Almost always, they're expensive to build, more expensive to operate. It's nigh impossible to get exact figures on the amount spent on piloting. But it probably amounts to 15% of the total research spending of chemical companies. That would come to more than $82 million this year.

In the petroleum industry, the percentage is higher, probably 40, or about $94 million.* There are several reasons why oil companies put such a large share of their research effort into pilot plants. An important one is that a considerable amount of piloting is needed to test new crudes. Another is the big incentive to improve existing processes: because of the large volumes involved, small increases in refinery efficiency result in huge dividends. And, logically, this type of process improvement is first carried out on a pilot scale.

Money and Men: The amount spent will, of course, vary from company to company, depending on definitions, bookkeeping practices and the individual corporate approach to research and piloting. Here's a rundown on how much of their R&D budgets some heavy research spenders allot to piloting:

Monsanto spends probably 10% for multipurpose pilot facilities, additional sums for integrated pilot plants. Hercules spends 10 to 20%. USI has set aside one-third of its budget for piloting over the next few years. Carbide says it devotes only a "small fraction" of its budget to piloting. Somewhat less than 10% of the budget at the Emeryville Research Center of Shell Development—research subsidiary of Shell Oil—goes for piloting. (These do not include outlays for market development programs that might make several thousand pounds of a product.) California Research, the research arm of Standard Oil Co. of California, puts about 30% of its petroleum process and chemical research efforts into pilots. E. J. Gohr, vice-president of Esso Research & Engineering, says that roughly one-third to one-half its process research budget goes for piloting.

Possibly even more important than the money spent is the amount of research and engineering talent tied up in pilot-plant work. Shell Development devotes 5% of its manpower to pilot-plant activity (again excluding market development programs).

A fully integrated pilot plant may tie up 10 to 150 men for periods ranging from six months to several years. And the chemical industry operates many such plants. Du Pont supports probably a dozen right now; Hercules operates only one pilot plant but a number of interim plants; Carbide has about six true pilot plants; Monsanto has nine multipurpose units, seven or eight integrated units.

That's why Robert Obrecht, laboratory director of Stauffer's Richmond, Calif., labs calls pilot-planting "a serious and expensive business." A. H. Batchelder, vice-president and general manager of the Richmond Laboratories of California Research, goes a step further, calls it "a real technological bottleneck."

Down to Terms: It has always been easy to whip up an argument on pilot plants among a group of engineers. But at least part of the difficulty stems from the lack of a standardized definition of a pilot plant.

Johnstone and Thring, in their book,† define a pilot plant as "any small-scale plant used to provide information about a future large-scale plant." Dave Brown, research vice-president of Scientific Design, thinks of it as "a mechanical analog, built to resemble the big plant as closely as possible." Tom Bennett, research engineer for Lummus, calls a pilot plant "a duplication of unit operations on a scale larger than glassware." C. L. Raymond, director of chemical development for Shell Development, says, "A pilot plant is not a scaled-down commercial plant. Piloting data are obtained on equipment from which you can extrapolate to a large plant, although the equipment does not necessarily resemble that in a large plant."

Confusion mounts when it comes to distinguishing between terms such as: pilot, semiworks, semicommercial, interim, demonstration and prototype.

For purposes of distinguishing the functions described by the various terms, most engineers will accept the following:

- A pilot plant is one built primarily to get engineering information for a commercial unit.
- A semiworks, semicommercial or interim plant is one intended mainly to produce for market development. It often provides useful information, however, for engineering the big plant. Often, too, one unit serves as both pilot plant and semiworks.
- A prototype or demonstration plant is a fully integrated unit, actually a small version of the commercial

*Five years ago, Leo J. Blatz, of Esso Research, assumed that one-fifth of the petroleum industry's research budget was a "reasonable estimate" for pilot plants (*Ind. & Eng. Chem., Aug. '53, p. 1620*). This, however, seems low at this time.

†*Pilot Plant Models and Scale-Up Methods*, McGraw-Hill, 1957.

plant. Its scale is larger than that needed for a pilot plant. It performs the functions of both a pilot plant and semiworks unit.

The Last Resort: Thanks to high costs, the one rule of pilot-planting to which almost everyone adheres is: never pilot-plant unless it's absolutely necessary. And some giant strides in chemical engineering theory and practice have made piloting unnecessary in certain instances.

Says Scientific Design's Brown: "Usually, most if not all the parameters can be calculated by clever chemical engineering, aided, if necessary, by selective laboratory or bench-scale work." He points out that a distillation step now is almost never piloted. His theory is that pilot plants may be attractive for some reasons but that their main purpose is to make samples for market development. He does concede, however, that some reactions or operations are tricky to scale up, cites certain catalytic reactions, in particular, as needing pilot study. He also singles out certain solids-handling problems and polymerizations.

Most industry engineers go along with Brown in principle. But there's some disagreement on just how often they can follow through in practice. "You can get by without a pilot plant, if you know enough about the process," says Charles Oldershaw, supervisor, research on chemical engineering for Dow at Pittsburg, Calif. "But then," he adds, "if you really knew enough, all you'd need would be a secretary and some draftsmen."

Shell Development's Raymond feels it's easier to sidestep the large-scale pilot plant in the petroleum field than in the chemical industry. "Essentially," he says, "it's a matter of the novelty of the reaction. In petroleum, where radically new processes are the exception rather than the rule, it may be possible to eliminate the large-scale pilot plant in three out of five cases. In chemicals, the ratio would be much smaller."

Lummus's Bennett puts it this way: "We're developing a field unit the Army can use to make nitrous oxide from ammonium nitrate. We have to find out how long it takes the nitrate to melt and we must pilot that step. No amount of clever chemical engineering could give us that answer."

Carl Oldach, assistant director of Du Pont's development department, would like to find the "clever chemical engineering" that would permit the direct commercialization of certain reactions. "If you understand the process well enough, you can scale up to a commercial plant from a 5-10-lbs./-hour plant, and your equipment costs may be down in the $100,000 range. On the other hand, in many processes, especially those involving polymers, you just don't know enough about the mechanism of the reactions. Many things affect the molecular structure, and, unfortunately, once a polymer is formed, you can not correct its structure the way you can further purify a simple chemical compound or modify a petroleum cut to meet a desired specification. In cases like that, you must go to bigger pilot plants, which tend to run in the million-dollar class."

There are other times, too, when a pilot plant is highly desirable if not downright necessary. Processes employing recycle usually call for one. Says Dave Torrans, manager of the chemical engineering division of Hercules research center: "When you're recycling a solvent, you may be building up 'strangers.' If you don't learn this at the pilot level, you'll have a hatful of headaches in the commercial plant. Or, if you're only converting a part of your raw material into product with each pass, you may be converting a few hundredths of a percent into a by-product. This might build up and interfere with the reaction. If we hadn't found that out about one process in a pilot plant, we would have built reactors just half as big as needed to achieve desired output under equilibrium concentrations of these small by-products."

Sometimes, too, a process is simply not operable on a laboratory scale. Imagine, for instance, a pulp industry process involving a slurry. It just isn't possible to move some slurries through small lines.

When to Pilot: If the first rule of pilot-planting is to do it only when necessary, the second is to do it only when you are practically certain of building a commercial plant. The idea of a pilot plant to "explore" or "prove out" a process is fast disappearing. "We never," says Shell Development's Raymond, "use a pilot plant to study chemistry. That's done in the laboratory."

The modern method is to start a running economic evaluation of the project as soon as it moves out of the exploratory stage. (For one company's approach to this, see box, p. 54). The process is kept on a bench scale and studied as thoroughly as possible. A decision to pilot is made only after the company has a firm idea of the size and cost of the commercial plant that will result. It should also have a good measure of the market potential for the product.

Moreover, the cost of the pilot should be viewed in relation to the cost of the big plant. Scientific Design's Brown feels that the average cost of piloting is probably 5-10% of the cost of the commercial installations, but can go to 15-20%.

There will be extremes, of course. Bob Hulse, executive vice-president of National Distillers and general manager of U.S. Industrial Chemicals Co. Division, says his firm is planning to spend $20-25 million/year on new plants for the next few years. Its piloting cost for that will be only $800,-000 ($300,000 for equipment, $500,-000 for operating costs).

On the other hand, California Research spent more than $1 million to pilot the isophthalic process that resulted in a $12-million commercial plant for Oronite. The company, however, is convinced of the ultimate potential for the product and considers the piloting money well spent.

In most cases, when the cost of piloting gets over 30% of the cost of the proposed commercial plant, the decision to go ahead should be made with great caution. Some plants, in fact, just can't stand the costs of a pilot plant. What do you do in cases where pilot-plant costs can't be borne?

As Hercules's Torrans sees it, you can accept a process that is not complete but on which you have general cost and performance data. Then, he says, you have two alternatives:

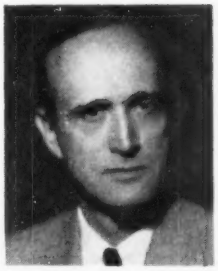
- Gamble on process improvements that haven't been precisely proved. If you do, you must overdesign the plant to compensate for lack of data.
- Let the process evolve. Build a crude but operable unit and let nature take its course. Torrans says most plants evolve like that anyhow, even if they are fully piloted. So the idea is not as crude as it might seem at first glance.

Keep Them Small: One good way

SHORT TAKES BY 15 WHO LIVE WITH THE COST PROBLEM

Stauffer's Obrecht
"Pilot planting is an expensive business."

Cal Research's Batchelder
"It's a real technological bottleneck."



Esso Research's Gohr
"Most of our process research is in pilots."

Hercules's Torrans
"Some plants can't stand the cost of piloting."

Cal Research's Lavender
"It may be possible to slash costs by 30%."

Shell's Raymond
"You can save money by rearranging basic pilots."

Lummus's Bennett
"You'd be surprised what old equipment can do."

National Distillers' Hulse
"From 70 to 90% of pilot equipment is expendable."

Dow's Barnard
"Bench-scale pilots may provide better data."

Monsanto's Nellums
"$1 on the bench saves $10 in the pilot plant."

Scientific Design's Brown
"Clever chemical engineering can eliminate pilots."

Du Pont's Oldach
"You don't need a pilot if you know enough."

Dow's Oldershaw
"If you knew, a secretary and draftsmen could do it."

Esso Research's Priestley
"Automatic pilots may be the answer."

Hercules's Van Wyck
"We need more chemist-engineer combinations."

to keep piloting costs down is to pilot on as small a scale as possible. Says Bob Nellums, assistant research director of Monsanto's Organic Chemicals Division: "We use a rule of thumb that pretty well sums up our feelings: if it costs $1 to get a piece of information on a bench scale, it will cost $10 to get it in a pilot plant, $100 to get it at the plant level."

His division operates an engineering laboratory, where it frequently ties together several unit operations in what is essentially a glassware pilot plant.

Dow does the same thing in what it calls "mini-plants." Robert Barnard, supervisor, production technical service for Dow at Pittsburg, describes a mini-plant as a "fully integrated plant that can be assembled and operated in the laboratory." The cost for such an installation is in the few-thousand-dollars range. This contrasts sharply with costs of normal pilot plants, "mighty few of which," says Hercules's Torrans, "cost less than $500,000 to build, modify and operate for the required time."

Says Barnard: "Data we obtained in mini-plants has sometimes provided better and more accurate engineering data for use in full-size plants than had been made available by pilot plants." They have, in fact, worked out so well that Dow can now boast of several installations that have been scaled up directly from them. As an example of what can be done, Barnard and Oldershaw point to one in which eight unit operations were integrated. It was operated for one year and provided data for a $5.5-6-million plant. Cost of the initial installation was $5,000. During the year, it was torn down and reassembled at least once to modify the process. Total cost, including operation: $150,000.

Few people will argue with Nellums or the two Dow experts that the more work you can do on a small scale, the better off you are. Hercules, in fact, has recently set up a special bench-scale group to find out how best to

Technology

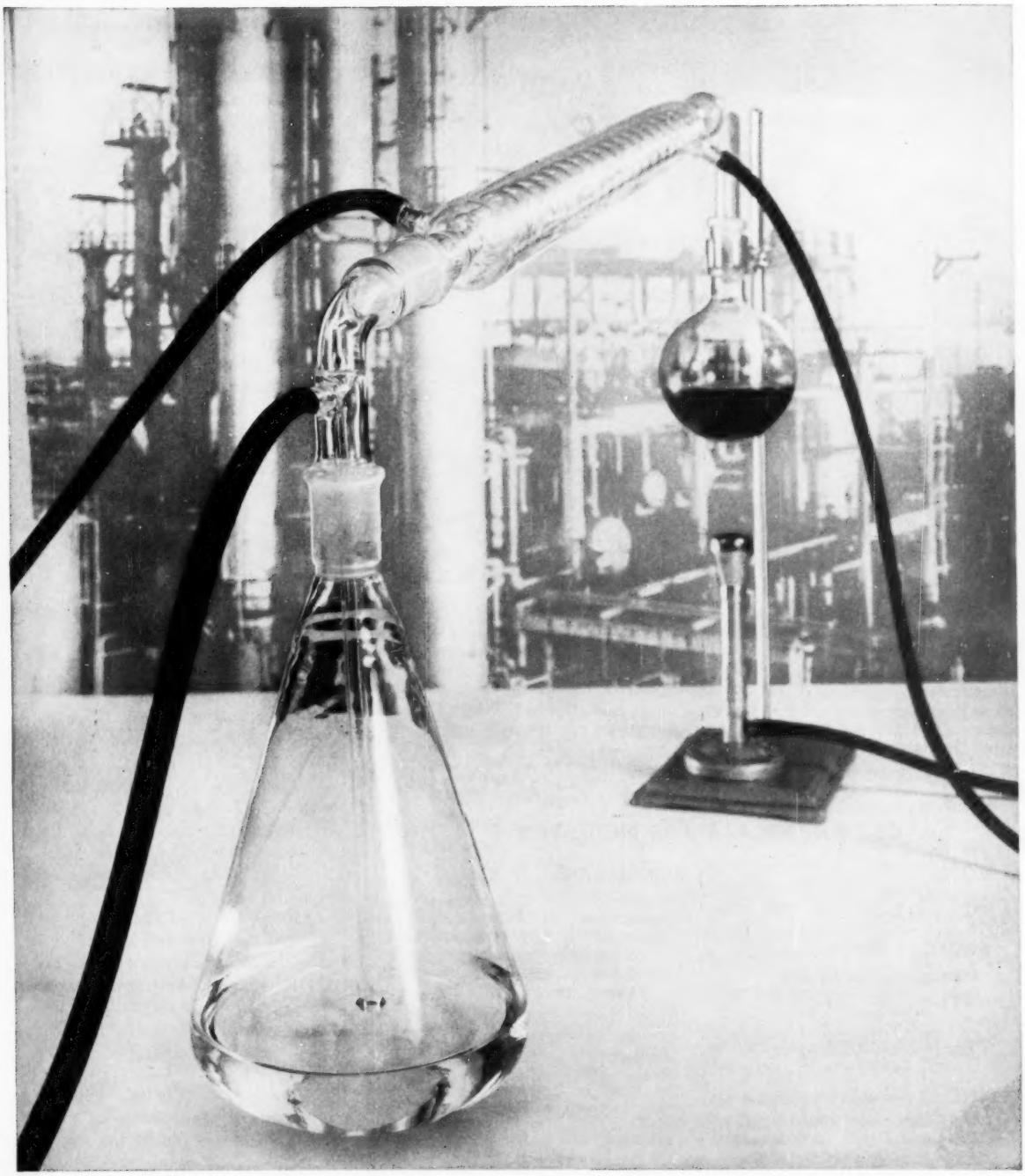
study processes on as small a scale as possible. But sometimes the mechanical operability of a process can't be measured on a small scale. Esso Research, for instance, spent a lot of time and effort studying fluidized reactions from a chemical standpoint. Still, it had to build a whopping 100-bbls./day pilot plant at Baton Rouge to study the mechanical aspects of a fluid cat-cracking operation.

The combination of that and the need for getting products for market development has, in fact, led to the building of some king-size pilot plants by companies that ordinarily eschew them. Carbide built an $11-million pilot plant for its coal hydrogenation process (*CW, May 10, '52, p. 66*). Dow is running an acetylene pilot plant that employs 8-ft.-diameter columns. Shell Development has built and operated acrolein and hydrogen peroxide pilot plants that many firms would be proud to call commercial units (Shell points out that, nevertheless, the units are too small to be economic for these products).

Make Them Flexible: Another favorite cost-cutting gambit is the use of flexible pilot plants. Carbide built a large multipurpose pilot installation adjacent to its research center in Institute, W.Va. It says the facilities have definitely reduced the pilot problem. Stauffer has invested several hundred thousand dollars, according to Obrecht, in multipurpose units at each of its four research and development locations, Chauncey, N.Y., Richmond and Torrance, Calif., and Houston. Monsanto operates nine multipurpose pilot plants and Shell Development has two big buildings set aside for that type work at Emeryville.

This approach usually involves chopping up the process into components and piloting whatever steps are necessary. "However," cautions Monsanto's Nellums, "I feel strongly that somewhere along the line, the process should be studied in an integrated unit."

Multipurpose units can considerably help the economics of piloting. California Research put up a flexible unit to pilot production of alkyd resins and polyesters from isophthalic. "It actually does the work of six units," Harry Lavender, manager, petroleum process research, development and engineering, says. It cost $70,000. But building



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six units would have cost three or four times that. In addition, it gives us quite a saving on space."

Stauffer's Obrecht feels that savings made possible by use of multipurpose plants can be "significantly large if the program is timely and well organized in advance." He points out that actual experience varies with these factors:

- Adaptability of process to change in products or one or more raw materials.
- Continuity of operation. This is particularly important if many technical and hourly people are required.

In short, it's desirable to have a sound knowledge of the long-term possibilities of the multipurpose usage.

- Extent of unit process steps that are under study.

Multipurpose units can also help side step the rule on piloting processes that are almost certain to be commercialized. Monsanto's Nellums sums it up this way: "During the course of a year, our labs screen hundreds of compounds for herbicidal activity. Maybe 10 will prove sufficiently active to justify large-scale testing, and our multipurpose pilot plant will supply material for these studies. Of the 10, however, perhaps only one will show the proper balance of performance in the field tests, economic evaluations and market development to merit selection for commercialization."

Flexible Interims: The multipurpose idea has been profitably applied to the problem of getting products for market development. American Cyanamid invested in a multipurpose semicommercial unit at its Warners, N.J., plant three years ago (*CW, April 9, '55, p. 46*).

Monsanto, too, has been employing multipurpose semicommercial plants. These plants are run by the research department and set up physically adjacent to the multipurpose pilot unit. They're used to make any amount of product, from 25,000 to 1 million lbs. Products are sold and the unit is self-sustaining. "However," says Nellums, "it doesn't make money. Some products make a little, others lose a little. The idea is simply to bridge the gap between pilot plant and production operations."

Unattended Pilots: Automation is probably the latest look in pilot plants. Esso Research is installing a $250,000

"Micro-Plant" controlled and programmed by a computer. When it's installed late this spring, it will be used to study catalysts for Esso's Powerforming process. The unit will run unattended, chatter out its results via punched tape or automatic typewriter.

Bill Priestley, section head in Esso's process research division, expects the automatic plant to eliminate many of the problems of piloting. "It will tell us exactly what is happening to the catalyst," he says. "It will save manpower and time. And it will give us more accurate information, and provide it immediately."

California Research has been working along similar lines. Batchelder and Lavender have two installations of which they are particularly proud. "They're not the whole answer to cutting pilot-plant costs," Batchelder says. "But we think they may be signposts."

- One is a unit for screening catalysts. It simultaneously measures the efficacy of six catalysts. Information from the unit is transferred to a data sheet, sent to a computer section, which returns the answer. Under the system formerly used, it cost $500 to study a catalyst. The new setup reduces this to $35/catalyst. And it saves "half a technical man."
- The other is used to test process functions—e.g., catalyst life. It requires only occasional attention from a technical man. Under the old method, it required three men per day to operate the unit, a total of 168 man-hours/week. The new system cuts this to 10 man-hours/week.

Making Do: It's possible to reduce the cost of building pilot plants by using existing equipment. Lummus's Bennett says: "You'd be surprised what you can do sometimes if you'd really try using old equipment and rearranging it. But you can never afford to scrimp on safety—particularly with electrical equipment or pressure vessels. A pilot plant has to be every bit as safe as any big plant you would design."

Shell Development's Raymond also feels it's possible to make savings by rearranging basic units of existing pilot plants to suit new processes.

But the possibilities along those lines are limited. USI's Hulse, for one, believes that most of the equipment used in piloting operations can't be reused. He says: "You have to figure

that between 70 and 90% of it is expendable."

Farm It Out? A relatively new idea being pushed by some engineering-construction firms is "contract pilot-planting." Lummus's Bennett puts it this way: "We can get the same answer as the operator himself can. And he doesn't end up with a bucketful of equipment he doesn't need. Nor does he tie up his men and space. He does get a share in the investment of the equipment and building for as long as we operate it. In the long run, it will probably cost him less."

Pilot Dividends: An important point to remember when considering pilot plants is that, although it may be desirable to do without them, you can get many advantages out of those you build.

A pilot plant, engineers agree:

- Can be a powerful sales weapon for convincing nontechnical management or possible licensees that something new has been found and that it works. Engineering-construction firms would also derive this advantage in dealing with potential customers.
- Affords what Scientific Design's Brown calls a "convenient way" of testing materials of construction. Small glass pilot plants are particularly valuable in this regard; sample of the reactor metal is simply placed in the reaction flask. Says Monsanto's Nellums: "Because the material will probably be exposed to the reaction conditions for an extended period, it's an excellent way—probably better than a conventional pilot plant—to get meaningful corrosion data. It also gives you a chance to determine the effects the metal will have on the process."
- Can be a big help in training the crews that will manage and operate the big plant.
- Will lessen risk of discovering process "bugs" in the big plant.
- Can be used to try out process improvements after the big plant is built. Normally, the ratio of operating cost to building cost will be 1:1 or 2:1. That's based on operation for a year or two at the most. Says Du Pont's Oldach: "If you have a pilot plant, you should continue to operate it for several years after the big plant is complete. This may push the ratio to 10:1. But it's a lot easier to try process innovations on the pilot

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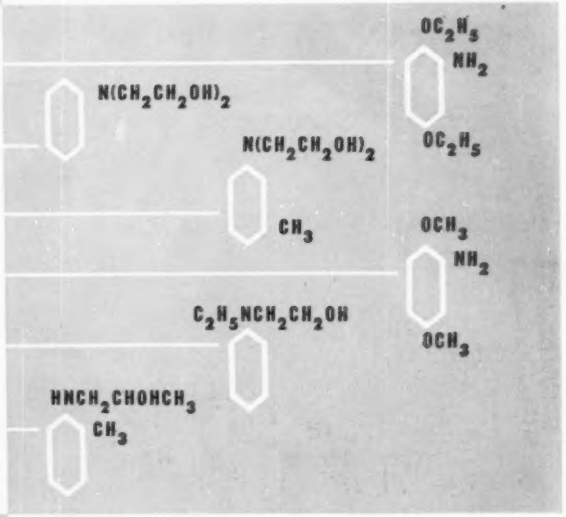

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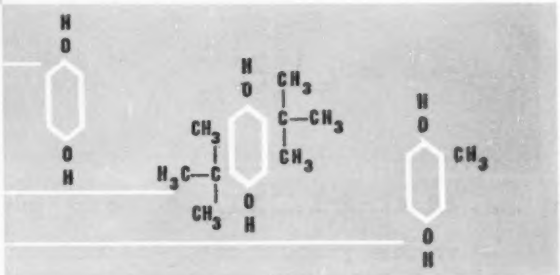

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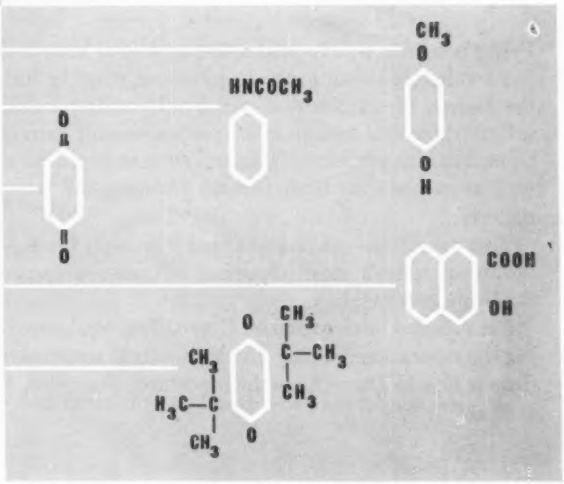

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How One Firm Handles Engineering Evaluations

The high cost of piloting has made the preliminary economic engineering evaluation more important than ever. The usual procedure is to start evaluating a research project at a very early date, continue to update and review the evaluation in the light of data that has been obtained. In this, Monsanto has gone a step beyond most firms, set up a special group (in its Organic Division Research and Development Dept.) to make engineering evaluations on a formal basis. This is how it works:

A group leader or development project specialist fills out a simple form requesting the evaluation. The job is then assigned a priority and the evaluation group takes it in order of urgency (rather than receipt). The project is classified according to available data. The evaluation group then works up a set of figures showing selling prices, return on investment, and fixed capital for different parameters (e.g., raw materials).

At the American Assn. of Cost Engineers' meeting in Cleveland on June 17, Monsanto will reveal how it has learned to program these equations on computers. This work will be published in *Chemical Engineering* June 30.

Monsanto feels that its system may help point up marginal or unprofitable projects fairly early, prove highly valuable in determining when, and what, to pilot-plant.

level. The extra costs will be justified by increased efficiency of the bigger plant."

Problems Ahead: Despite the advances that have been made, there are still many problems to be solved.

Shell Development's Raymond says: "One of our big problems is how to make multipurpose equipment more multipurpose."

Lummus's Bennett says that it's often impossible to find an instrument, a valve, or other equipment small enough. So the pilot has to be made

larger than otherwise necessary.

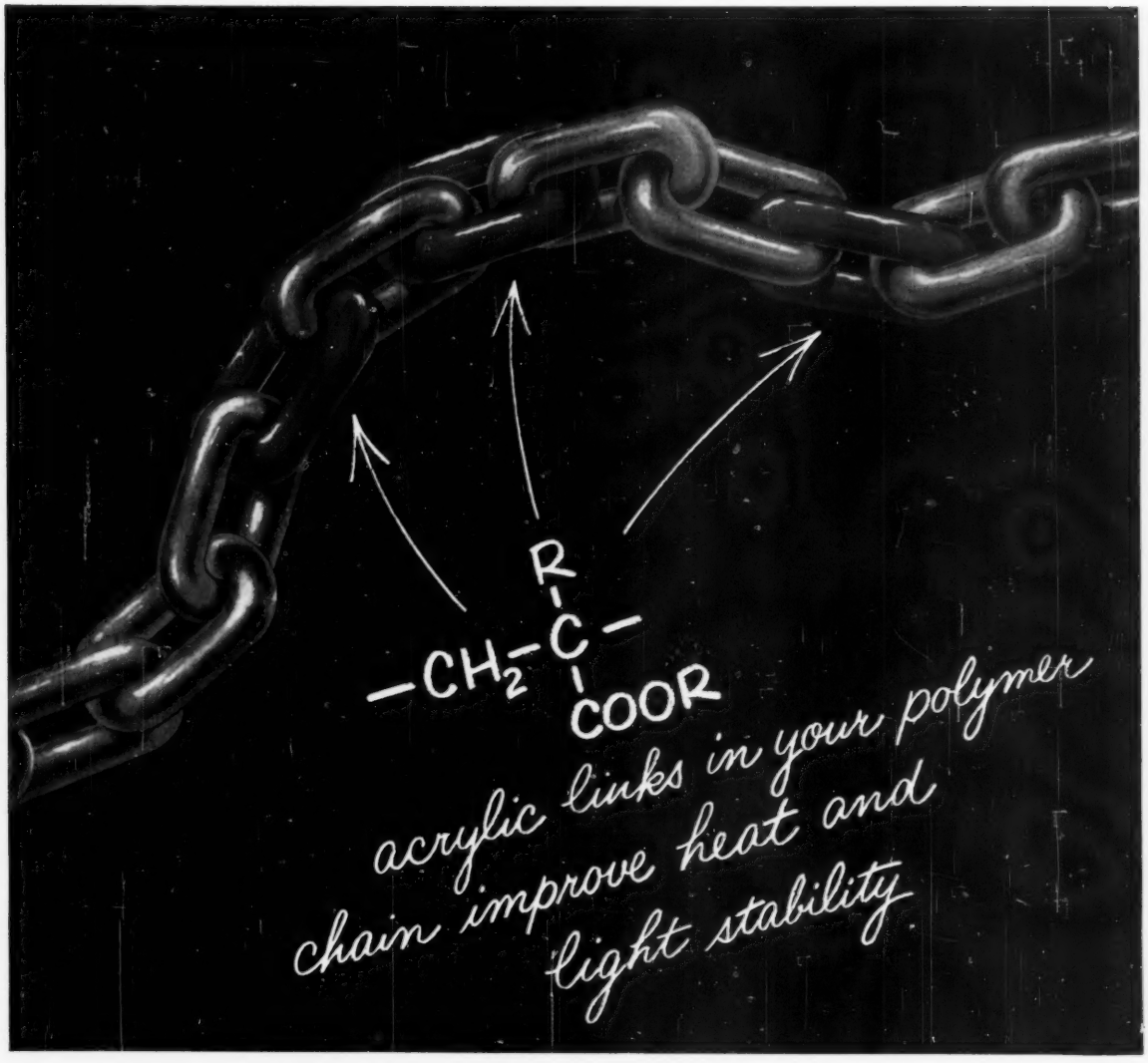
Cal Research's Lavender estimates that 15% of the firm's research budget is spent on pilot equipment and direct operating costs of pilots. But an equal amount is spent on analytical work and other pilot-supporting services. He feels that by tieing instruments into the line and effecting other improvements, it may be possible to slash total pilot costs 30%.

USI's Hulse points to problems in interpreting pilot-scale results in terms of large-scale production of new metals processes, because contamination by impurities is proportionately greater in small equipment than it is in large equipment.

Dow's Barnard would like to see more scientific work done on methods of providing sampling information for market estimation and product acceptance testing. A solid statistical effort, he feels, would go a long way toward reducing the size of interim plants required to produce material for market analysis. Peter Van Wyck, director of Hercules's research center, sees a need for combination chemist-engineers for process development work. "We need men who can talk to chemists and chemical engineers both," he says. "The trouble is that when we find such a man, he usually moves up into administrative duties."

Road to Profits: There has been considerable talk about the use of devices such as analog computers to eliminate the pilot plant altogether. The idea is to set up a mathematical model of the process being studied. Then the effect of a number of process variables can be tested out in the computer. Monsanto (*CW, Jan. 4, p. 43*) and others are using this technique. But, although it holds great promise, much more must be learned of chemical processing and chemical engineering techniques before computers will have a measurable effect on the number of pilot plants that are built. "After all," says Scientific Design's Brown, "a small pilot plant is just about the best analog you can get. And it may be cheaper than a computer program in the long run."

Leo Baekeland summed up today's philosophy on pilot-planting over 40 years ago when he said: "Commit your blunders on a small scale and make your profits on a large scale." The modern trend is to substitute "bench" for "small."



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CHEMICAL WEEK
June 7, 1958

First municipal water-desalting plant in the U.S. will be installed late this year by the city of Coalinga, Calif., a small (population, 6,000) oil and farming center in the San Joaquin Valley. Following a two-month demonstration of a small electric membrane plant by Ionics, Inc. (Cambridge, Mass.), the Coalinga city council last week approved the acquisition of a 28,000-gal./day unit to supply the city's separately distributed drinking and cooking water.

Coalinga's present supply of well water is brackish, contains about one-fifteenth as much salt as sea water. Its drinking water must be hauled in 45 miles by rail, last year cost over $43,000 for a 17,000-gal./-day supply. Ionic's new plant will employ four 300-membrane stacks to reduce dissolved solids from 2,000 to 290 ppm. at an estimated cost of $1/1,000 gal., is expected to save the city more than $400,000 in the next 10 years. Initially, the city will lease the $90,000 plant for $2,500/-month, plus $350/month for service, with a 30-month option to purchase the facility.

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Isomerization of xylenes on a commercial scale will get its try-out in Japan. Mitsui Petrochemical Industries, Ltd. (Tokyo), has licensed Atlantic Refining Co.'s Octafining process to boost the yield of para-xylene from the C_8 refinery stream. Atlantic spent three years developing the process, proved it out in a large pilot plant.

Mitsui's commercial plant is now under construction at Iwakuni, 40 miles southwest of Hiroshima. It will make 11 million lbs. of para-xylene annually. Designed and engineered by Scientific Design, the plant is scheduled to be completed next summer.

This is how the process works: Para-xylene (which makes up 18-23% of the C_8 stream) is removed by fractional crystallization. Efficiency of this step is not 100%, so 7-10% para remains in the stream. That's sent through the Octafining step, which is essentially a treatment with hydrogen under pressure in the presence of a platinum-silica-alumina catalyst. This brings the stream again to about 20% para, which can then be sent back to the fractional crystallizer. The same process can be used to boost yields of other C_8 hydrocarbons.

Isomerization has been suggested before as a means of solving the problem of market balance of the xylenes (*CW, April 6, '57, p. 32*). But costs were thought to be excessive. Atlantic, however, feels that the process is economically justified whenever a refinery doesn't have enough of the desired isomer to meet its needs. In short, Atlantic believes that Octafining is cheaper than buying a mixture of isomers. In fact, the company developed the process because it was itself interested in making para-xylene. (Presumably it is still interested, although no decision has been made.) Atlantic also reports considerable interest in the process

and wouldn't be surprised to see licensees pop up in the U.S. as well as in other foreign countries.

•

Discovery of ferromagnetism in a nonmagnetic intermetallic compound was an unexpected—and potentially significant—result of recent low-temperature studies at Bell Telephone Laboratories (New York). Bell researcher B. T. Matthias found that a zirconium zinc compound ($ZrZn_2$) becomes ferromagnetic below 35 K (—238 C), at which temperature its characteristics are similar to those of conventional ferrites at room temperature. This is the first time, says Bell, that ferromagnetism has been observed in an intermetallic compound that doesn't contain at least one strongly para-magnetic element.

•

Apache Powder Co.'s new "baby" ammonia plant is now fully onstream at Benson, Ariz.; it achieved capacity-rate production last week. The Girdler-built, 30-tons/day plant is believed to be the smallest, completely integrated ammonia plant in the country.

The baby plant employs conventional processes, is expected to produce ammonia at a cost equal that of more conventional-size installations (100 tons/day is the generally accepted minimum size). If successful, market experts believe, Apache's unit could foreshadow other small-plant units.

•

Du Pont will produce a new grade of ultrapure silicon under a process-license agreement completed last week with International Telephone & Telegraph Corp. (New York). The new process was developed by ITT affiliate Standard Telecommunication Laboratories, Ltd. (London), reportedly produces a grade of silicon that surpasses the purity of any of those now commercially available. Though neither Du Pont nor ITT has disclosed details of the method, a clue to the possible silicon purification route is contained in recent Australian patent applications filed by Standard Telephones & Cables Pty. Ltd., an Australian subsidiary of ITT. The method: decomposition of "substantially pure silane (SiH_4)." Du Pont currently produces "hyperpure" silicon (impurities measured in few parts per billion) by zinc reduction of silicon tetrachloride; some other producers have versions of the silane decomposition process (*CW, Jan. 18, p. 55*).

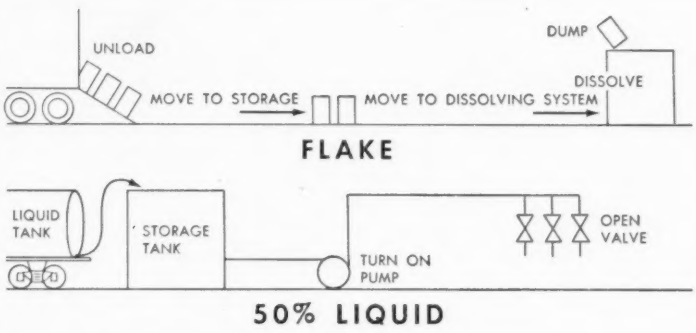
•

A new inorganic copper complex fungicide will be made available on a pilot-plant scale next week. Henry Bower Chemical Mfg. Co. (Philadelphia) will start selling DY-Q-PLEX-1 in 5- and 25-lb. containers on June 15. It's a fine, water-insoluble crystal having the approximate empirical formula $[Cu(OH)_2]_{100} \cdot (PO_4)_3 \cdot SO_4$.

The product has been undergoing field tests (*CW, April 12, p. 76*). Bower says it has been effective on a wide variety of harmful organisms when used in concentrations between 0.005 and 0.05%, feels it has unusual interest as a fungicide, moluscicide and rodenticide. And because of its particle size (0.01 to 0.5 microns) and high copper content it may hold promise as a catalyst.

BRIEFS for buyers of

Caustic Soda
Sulfur Chlorides
Trichlorobenzene
Caprylyl Chloride



How flake caustic soda users might save some money

If you use flake caustic soda in tonnage quantities, you might save quite a few dollars by switching to Hooker 50% liquid.

Flake caustic soda takes a lot of handling. In fact, it probably costs you as much as $4.00 per ton or more in handling *inside your plant.* Flake costs more than liquid to start with, too.

Besides being lower priced, many users estimate that 50% liquid caustic costs less than $1.00 per ton of caustic soda in plant handling.

Call your Hooker contact to help you compare prices and freight rates along with equipment costs. You'll never know what savings you might make until you do.

The coupon will bring you data sheets on both flake and liquid caustic soda.

Some facts on $C_6H_3Cl_3$

Hooker Trichlorobenzene, Technical, is a mixture of the 1,2,3- and the 1,2,4-isomers in a clear, practically colorless liquid.

It has wide use as a general solvent for fats, oils, waxes, and resins. With no flash or fire points up to its boiling point, it is of interest as a non-flammable heat transfer medium in the range of 210-300° C. Other uses are as an intermediate for preparation of dyestuffs and other organic chemicals.

Additional physical properties, use data and complete specifications are listed in our data sheet.

Check the coupon for a copy.

Why we make a better caprylyl chloride

Improvements in fatty acid processing have enabled us to obtain caprylic acid of substantially increased purity over that of former years. This results in a caprylyl chloride of 90-95% purity, with only small quantities of the hexanoyl and decanoyl chlorides. Another edge that we have in producing this and other acid chlorides is our basic position in chlorinating agents.

The Hooker product has a typical chlorine content of 21.8%. 90% distills in the range of 183-212° C. Its freezing point is below minus 70° C.

For complete specifications and additional typical data, check the coupon.

SCl_2 or S_2Cl_2

Which is better for your chlorination?

The sulfur chlorides are closely related and are good, low cost chlorinating agents. For actual use, various factors determine which of the above may be preferred as the chlorinating agent. We manufacture both products and can supply whichever you require for your own particular operations.

Hooker sulfur monochloride is a yellow to slightly red liquid with 52-52.5% chlorine. Hooker sulfur dichloride is brownish-red in color and contains a minimum of 66% chlorine.

There are a number of helpful tips on which product to use as well as information on other Hooker chlorinating agents including sulfuryl chloride and thionyl chloride in our bulletin 328-A, "Chlorinating Agents." Check the coupon for your copy. Data and specification sheets on each product are also available.

For more information, check here:

- ☐ Caustic Soda
- ☐ Caprylyl Chloride
- ☐ Trichlorobenzene
- ☐ Sulfur Monochloride
- ☐ Sulfur Dichloride
- ☐ Bul. 328-A, Chlorinating Agents

Clip and mail with your name, title, and company address. When requesting samples, please use business letterhead.

HOOKER ELECTROCHEMICAL COMPANY
706-1 FORTY-SEVENTH STREET, NIAGARA FALLS, N. Y.

Sales Offices: Chicago Los Angeles New York Niagara Falls Philadelphia Tacoma Worcester, Mass.
In Canada: Hooker Chemicals Limited, North Vancouver, B. C.

HOOKER CHEMICALS PLASTICS

CW PHOTO—LIONEL CRAWFORD

For the crowds at the packaging show in New York last week, resin makers had a special message.

Packaging Show Standouts: Plastic Films

New films, containers, machinery and supplies were jammed into almost all of the 400 booths last week at American Management Assn.'s National Packaging Exposition in New York. Here's the rundown of the major innovations of significance to the chemical manufacturer, both as a supplier of raw materials and as a major user of packages.

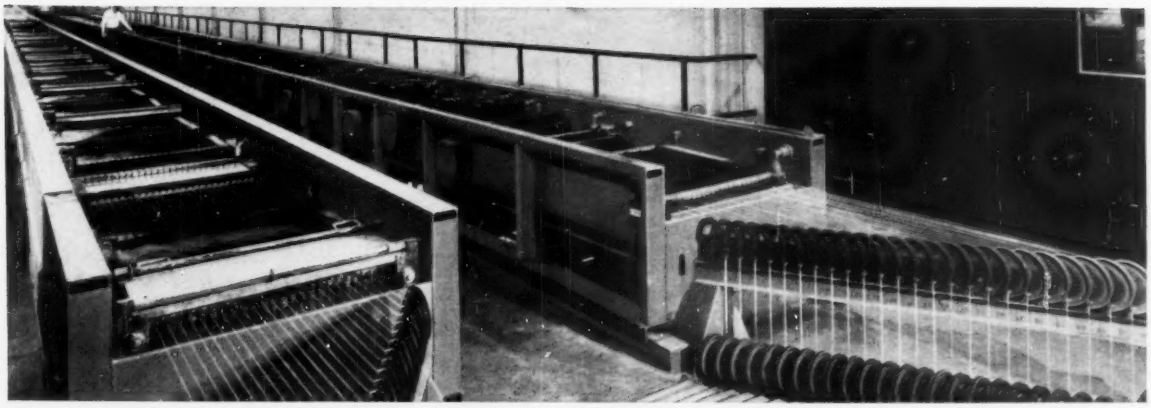
Film: Eager for a share of the potential 230-million-lb. market this year for plastic film, resin makers gave prominent display to their new materials and new uses for them. Oriented polypropylene film—½ mil thick—bowed in at the Minnesota Mining & Mfg. booth. Based on the Hercules polymer, the film combines high clarity, high yield (61,000 sq.in.), high strength and high-temperature performance with low-moisture sensitivity and strong resistance to acids, alkalis, solvents and oils. The material will sell at 4½¢/1,000 sq.in., is expected to find wide use in sterilizable packages, liners, overwraps and shrink-packaging.

At the Spencer and Du Pont displays, nylon films were suggested for oil containers, carton and letter windows, bags and overwraps. Toughness and oil- and temperature-resistance are among the strong points of nylon film: ½-mil-thick film is claimed to have strength comparable to 1½-mil polyethylene.

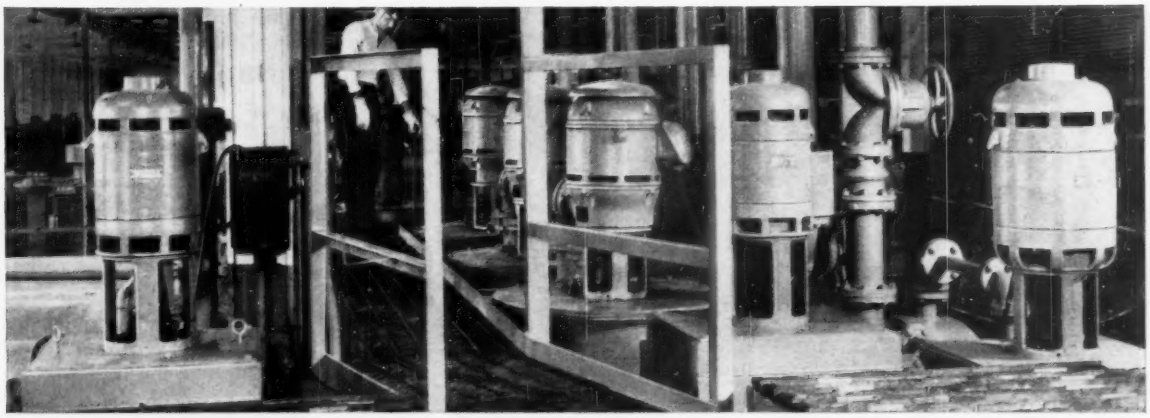
In polyethylene, U.S. Industrial Chemicals showed 3/10-mil-thick blown film—believed to be the thinnest film of its type offered commercially. A special resin, said USI, is responsible for the new development. And, at Monsanto's exhibit, four new types of polyethylene resin were introduced for the first time. Continental Can's Shellmar-Betner Flexible Packaging Division used the show to launch its linear polyethylene film, Conolex. Featuring easy tearability, the film is claimed to cost less than cellophane or cellulose acetate. S-B will initially aim promotion at cigarette and paper product outlets.

Polyethylene film applications in bread wrapping turned up at the Milprint and Crown Zellerbach exhibitions. CZ and Ludlow Papers, Inc., plan film-converting plants adjacent to Spencer's resin plant at Orange, Tex. Also aiming at bread-wrap markets: Reynolds Metals. It showed a new aluminum foil bread-wrap.

Besides showing their wares, polyethylene producers also exhibited new film-processing machinery. Rapid bag packagers, a special machine that overwraps a dry-cleaned garment in five seconds and other items that hold considerable promise of further expanding the film markets were shown.



For high product quality, solutions are constantly circulated through these tanks used to copper plate steel wire.



For low pump maintenance, parts contacting copper fluoborate electrolyte and 4 other corrosives are cast of nickel-containing stainless steels.

Cast stainless steels bolster life of pumps circulating copper fluoborate electrolyte

... brush off aggressive attack by this and 4 other corrosives

You can throw a lot of copper from a copper fluoborate solution.

But when pH is under 1 and the bath ranges up to 135°F, the corrosive capabilities of this electrolyte deserve respect.

Western Electric Company's Point Breeze Works protects important units with nickel-containing stainless steels. Take the vertical Aurora* pumps that circulate the fluoborate. Chromium-nickel stainless castings are specified for every part below the base plates ... including support and discharge pipes. For studs and nuts, corresponding wrought grades of chromium-nickel stainless are called for.

Type CF-8M alloy castings are used for several 50-gpm pumps in filtering and solution handling. Type CN-7M alloy castings are employed in four 800-gpm units circulating electrolyte from tanks to cells.

CF-8M (20% Cr, 11% Ni, 2.5% Mo, 0.08% max. C) and CN-7M (29% Ni, 20% Cr, 3% Cu, 2% Mo, 0.07% max. C) are Alloy Casting Institute designations.

These nickel-containing cast stainless alloys are also used in pumps handling 4 other severe corrosives in the plating process ... mixed alkalies at 190°F; 15% sulphuric acid at 90°F; hydrofluosilicic acid at 90°F; and lead fluosilicate at 150°F.

Chromium-nickel stainless steels exercise an effective restraint over corrosives like these. That's plainly shown in the Inco booklet, "Corrosion Resisting Properties of the Austenitic Chromium-Nickel Stainless Steels." Let us send you a copy.

*Aurora Pump Division of New York Air Brake Company, Aurora, Illinois.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street INCO New York 5, N.Y.

INCO NICKEL

NICKEL ALLOYS PERFORM BETTER LONGER

SALES

Capitalizing on its recent announcement of a low-cost polystyrene film (*CW, May 31, p. 73*), Dow drew considerable traffic with a large display. Food products predominated in the polystyrene section.

Aerosols: The trend shown in aerosols is clearly to high-speed rotary filling equipment. Mojonnier Associates exhibited a new filling line for nitrogen aerosols and nonaerosol packaging. The line uses a 16-head rotary filler, a 12-head rotary crimper and a 16-head rotary gasser. Capable of handling containers up to 16 oz. in size, the installation can whip out 300/units minute. Mojonnier also showed a rotary air cleaner, a purger to remove air from containers, an automatic valve applier and a line of laboratory aerosol-filling apparatus.

Rotary equipment was also big news at the Alpha Engineering Works booth. Alpha launched a new rotary pressure filler for fluorinated hydrocarbons, a rotary product filler and rotary nitrogen gasser. The pressure filler is claimed to work on a new principle—differential pressure—that allows rates of 200 cans/minute. High fill accuracy (to within 1 gram on a 16-fluid-oz. charge) is one of the unit's key selling points.

Machinery: New skin and blister packaging machinery was more in evidence this year. Erco Mfg. Co. launched a high-speed bubble-type packer, featuring high-frequency dielectric sealing and a paperboard die cutter. Capacity is rated at 7,200 packages (2¾ x 3½ x ⅝ in.) per hour. Eastman Chemical, with an eye on markets for butyrate plastic, demonstrated the machine. Comet Industries demonstrated an automatic skin packager that fabricated and slit packages to size.

Air-operated, hand-held, portable bag closers debuted at the Dave Fischbein Co. booth. Equipped with fiber gears, the single-operator machine is sparkproof, is claimed to be capable of sealing 200 bags/hour.

A new sanitary-filling machine for loading cans, jars, boxes or bags with powders, pastes or granules was unveiled at Food Machinery and Chemical's display. Parts contacting the product are of stainless steel and the machine is claimed to meet governmental sanitary regulations.

A testing device that permits line-by-line comparisons of the legibility

of printing on packages was offered by R. E. Rosen Corp. A calibrated screen with electronically controlled opaqueness does the trick.

Containers: Gaylord Container entered a new corrugated container, the DRUMpaket, in the race for packaging markets. The hexagonal unit has top and bottom caps that automatically interlock with the body. This eliminates the need for closing equipment, strapping or tape. The DRUMpaket can be lined with plastic bags, is available in 2½- to 62-gal. sizes.

Plax Corp. unveiled several new entries in both industrial and consumer packaging. One industrial container is a 1-gal. rounded-square bottle made from low-density polyethylene. For consumer packaging, Plax displayed a 16-oz., high-density polyethylene container to sell for about 7¢. Other sizes, Plax reports, will soon be added to the line.

Recently introduced polyethylene shipping sacks (*CW, May 31, p. 73*) drew numerous inquiries from showgoers. Central States Paper & Bag displayed bags at its own booth. Bags from Chippewa Plastics were shown at Spencer and Monsanto exhibitions.

Materials: Eastman Chemical Products emphasized its low-melt polyethylene resin, Epolene C. The low melt point enables the resin to be coated on kraft, glassine, parchment and chipboard paper with conventional wax-coating equipment, is said to avoid need for extrusion-laminating equipment.

This week, chemical packaging material salesmen will be back on the road—carrying bundles of inquiry cards from the show's 40,000 visitors.

DATA DIGEST

- **Liquid packaging:** Data sheet discusses packaging of liquid chemicals in polyethylene, using a corrugated overpack. Hinde & Dauch (Sandusky, O.).
- **Acrylic emulsions:** 30-page manual describes technology of acrylic latex paints for interior use. Physical properties, manufacture, bulk handling, paint application, sealers and primer sealers, white top-coats and tint bases and colored paints are described in detail. Rohm & Haas Co. (Philadelphia).

when you depend on Publicker!

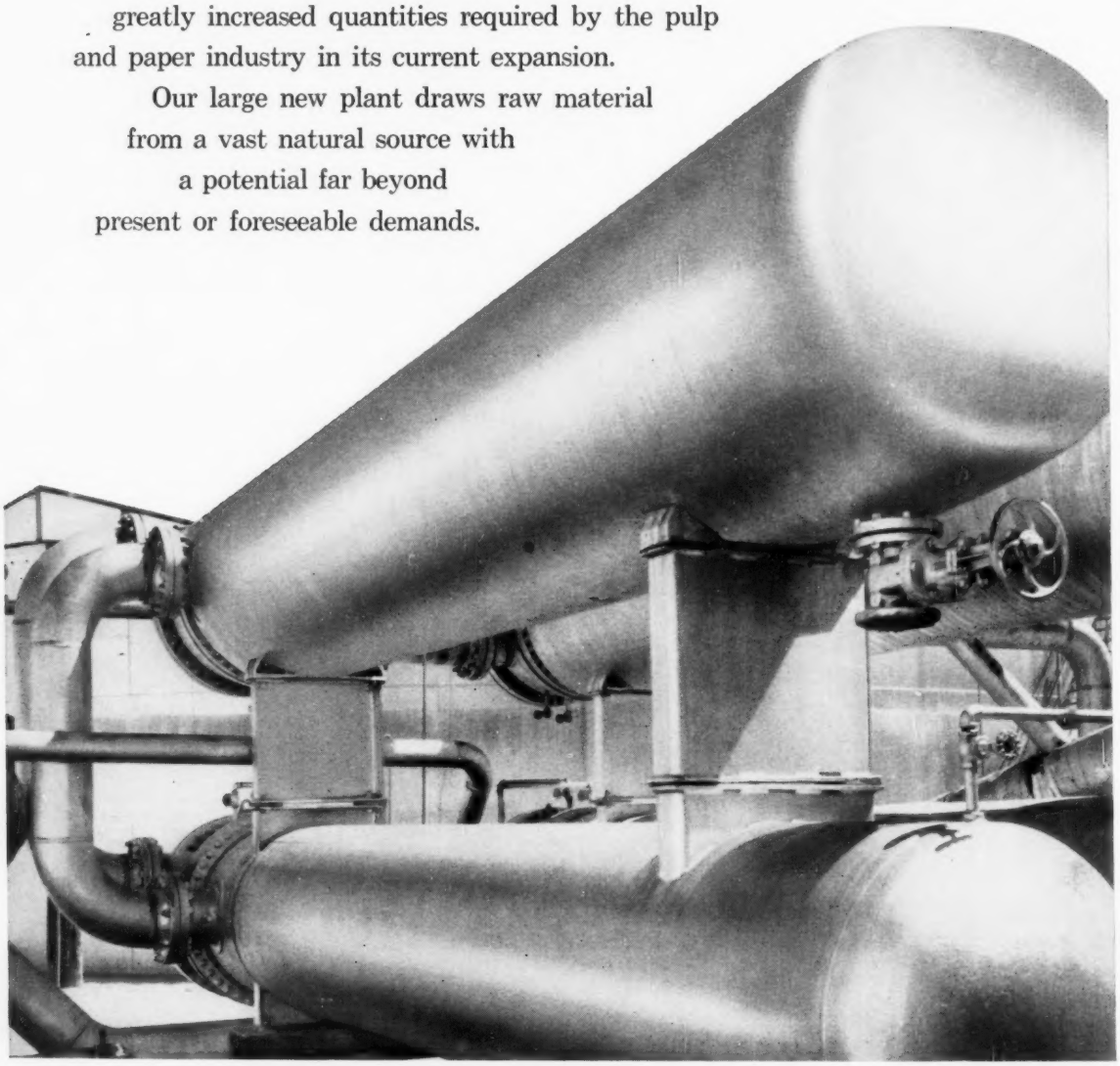
For Uniform Quality—Steady Supply—Prompt Delivery

★ *Ethyl Alcohol*	★ *Acetaldehyde*	★ *Acetone*
★ *Butyl Alcohol*	★ *Ethyl Acetate*	★ *Acetic Acid*
★ *Butyl Acetate*	★ *Amyl Acetate*	★ *Refined Fusel Oil*

SALT CAKE is a primary West End product and we have the production capacity to meet your needs

At West End, salt cake is a prime product . . . not a by-product . . . and is being produced in the greatly increased quantities required by the pulp and paper industry in its current expansion.

Our large new plant draws raw material from a vast natural source with a potential far beyond present or foreseeable demands.



WEST END

West End Chemical Company

DIVISION OF STAUFFER CHEMICAL COMPANY

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Market Newsletter

CHEMICAL WEEK
June 7, 1958

Speedy action to meet the competition of methanol price cuts, initiated last week by Du Pont, is reported by other major methanol producers. Some new schedules will reflect Du Pont's action right down the line; they become effective the same day (June 1).

The methanol price reductions result from a major revision of shipping procedure, which abandons a complicated system of freight equalization. Original f.o.b. terminal and f.o.b. plant pricing is completely replaced by an all-delivered price schedule, which means that, in most cases, methanol buyers everywhere in the U.S. will pay the same gallon price for like quantities. Exceptions: Eastern metropolitan area users get a special price on tank-wagon loads; users in Arizona, Idaho, Montana and Utah pay a premium.

For example, in tank cars and tank transports, methanol will now sell for 26¢/gal., compared with the previous delivered price of 32½¢/gal. or with f.o.b. terminal price of 29½¢/gal. in states east or Idaho, Utah, Montana and Arizona.

Methanol in tank-wagon quantities of 2,000 to 4,000 gal. will be delivered at 31¢/gal. in Eastern metropolitan areas. In drums, the cost everywhere will be 47½¢/gal., delivered, in carload and truckload quantities, and 54½¢/gal., in less-than-carload quantities.

Bargeloads of 250,000-gal. minimum will be delivered alongside wharfs on inland or intracoastal waterways in the East and Midwest at 24½¢/gal., a cut of 4½¢/gal. Prices on the Pacific Coast and in Idaho, Utah, Montana and Arizona will be 4¢/gal. higher than in other states.

All producers emphasize that users who pick up methanol at terminals and plants will not receive freight allowances.

But not all methanol producers are going along with the pattern of price reduction initiated by Du Pont. Commercial Solvents, for one, will continue to maintain its terminal pricing structure. The firm's Eastern terminal price for methanol was dropped to 25¢/gal., f.o.b. bulk, minimum 4,000 gal.; comparable price on the West Coast is now 29¢/gal.

Other price cuts posted last week underscore the more-often-down-than-up price trend now prevailing throughout the chemical industry. Reduced, for example, are tabs on Eastman Chemical's low-molecular-weight polyethylene resins. The firm's nonemulsifiable resin, tradenamed Epolene N, is cut 10¢/lb., to 35¢/lb. Price of the emulsifiable resin—Epolene E—is reduced 8¢/lb., to 40¢/lb. Both quotes are for truckload quantities.

Lower polyethylene resin prices are also posted by Allied Chemical. Price reductions of 5¢/lb. apply to two grades (6A and 617A) of low-molecular-weight resins, bring the tabs down to 30¢/lb. (truckloads)

for each. Reason for the cut: "to bring cost of these powdered grades in line with pellet-size material."

•

Down, too, are prices of aerosol surfactants made by American Cyanamid. Reason for the reductions, says Cyanamid, is "increased production and growing use of surface-active agents in scientific and industrial application."

Price reductions for various grades range from 2¢/lb. to 40¢/lb. The tradenamed Aerosol OT-75 Percent, for example, is reduced 23¢/lb., to 45¢/lb., in minimum quantities, and to 35¢/lb. in tankwagon loads.

There's a new source of antiknock compounds on the Pacific Coast. Onstream this week is Ethyl Corp.'s new unit in the San Francisco Bay area (Pittsburg, Calif.). The installation, part of an over-all $125-million expansion and improvement program, is the fourth tetraethyl lead plant opened by Ethyl since '52.

•

Sulfur output in western Canada will jump more than 500% by '75, bringing the value of annual production in the province of Alberta to at least $40 million, according to a "conservative" estimate by Calgary Power Ltd.

Significant to U. S. sulfur producers is the firm's belief that Alberta sulfur will compete in eastern Canada in the near future—if sulfur prices and freight rates are cut. Otherwise, Alberta sulfur will channel into world markets, competing with U. S. and Mexican material.

Total Alberta sulfur capacity is now about 100,000 long tons/year. Existing plants—after expansions—will have a total capacity of 320,000 tons/year. Four new plants are planned. Three will be in Alberta (Calgary, Coleman and Innisfail); Jefferson Lake Sulphur's 100,000-tons/year plant will be located in the Peace River district of British Columbia.

Value of the entire Alberta industry group, in '75, is estimated at $370 million. It will include: natural gasoline and hydrocarbons, $20 million; refinery production, $300 million; sulfur, $40 million; coal products, $10 million.

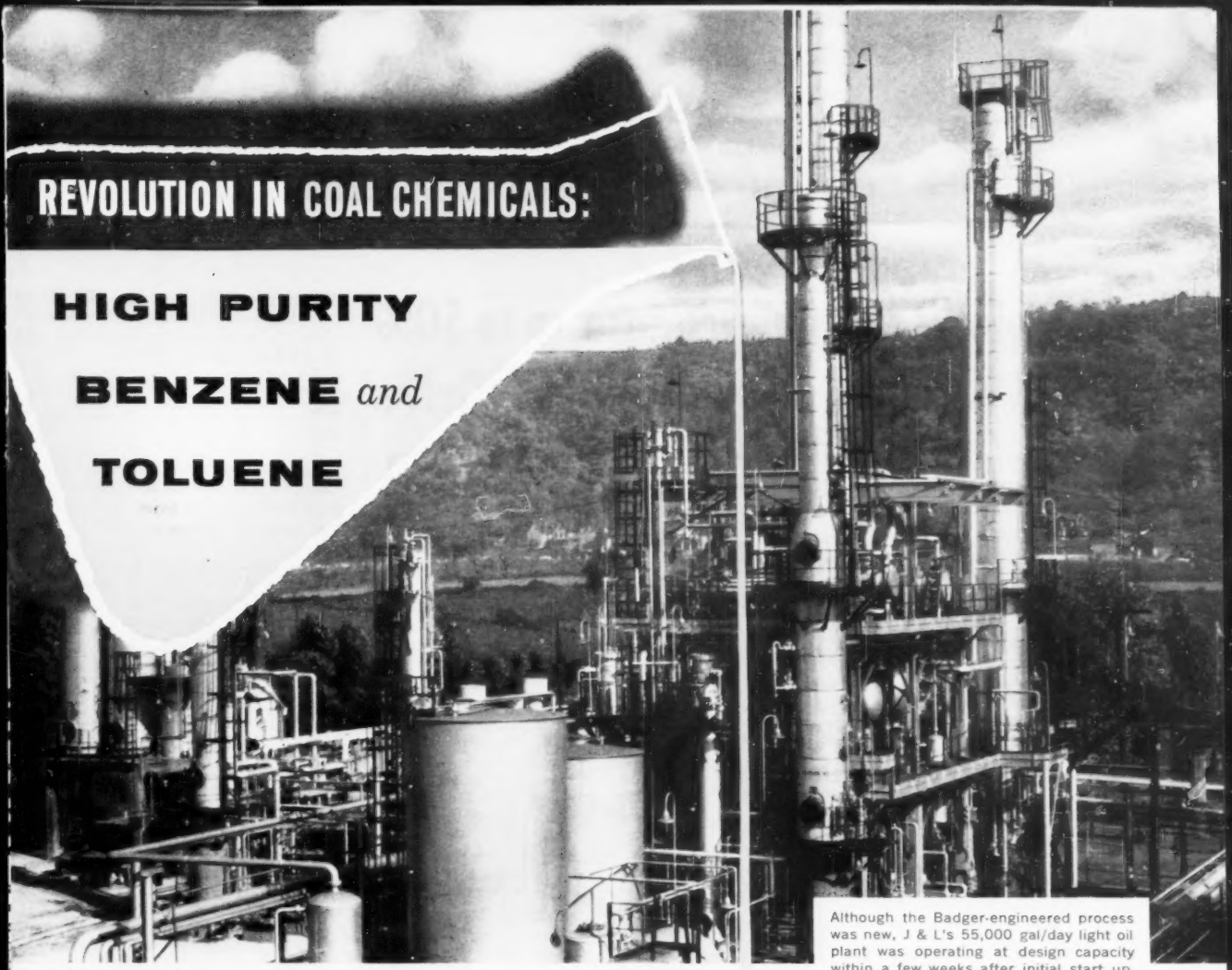
SELECTED PRICE CHANGES—Week Ending June 2, 1958

	Change	New Price
UP		
Potassium stannate, dms., frt. alld., E.	$0.005	$0.755
Stannous sulfate, dms., wks.	0.006	1.021
Tin metal (Straits)	0.0075	0.9475
DOWN		
Tankage, Chicago, animal feeding, 9-11% ammonia, ton	0.50	7.50
Pyridoxine hydrochloride, bots., 500-gram lots or more, kilo	27.00	218.00

All prices per pound unless quantity is stated.

REVOLUTION IN COAL CHEMICALS:

HIGH PURITY BENZENE *and* TOLUENE



Although the Badger-engineered process was new, J & L's 55,000 gal/day light oil plant was operating at design capacity within a few weeks after initial start up. This plant marks the first time Esso's Hydrofining and Universal Oil Products Company's Udex processes have been adapted in combination for coal chemical operations.

Acid washing eliminated in new plant built for J&L by Badger

STEELMAKERS, saddled with conventional processes, have been hard pressed to satisfy market demands for near absolute purity benzene and toluene at low cost.

Jones & Laughlin Steel Corporation, looking for a solution to this critical problem, turned to Badger for engineering counsel. Their combined decision: A completely new type plant based on processes proven in other industries but new in coal chemical operations. Now on stream, J & L's new plant is producing benzene and toluene of higher purity than similar products derived from any other source.

What's more, this pioneering plant promises important operating economies. Hydrogenation has been substituted for the conventional acid washing step. This important process improvement not only increases amount of product recovered but also eliminates a source of high maintenance costs. Also, the plant and its controls are completely integrated with other process units for labor saving operation.

The broad experience of Badger Engineers — and their ability to use it in solving new problems — served J & L well. Many other clients, too, say such experience is a Badger difference that "makes the difference." Wouldn't it be wise to inquire how it could serve to make your engineering and construction projects more successful?

THE BADGER KEY MAN

From initial negotiations to "on stream" you deal with a Badger principal. Badger Engineering projects are group efforts headed by a Key Man. More than just a sales engineer, he is always a Badger principal, always the Key Man in the execution of your project.

By channeling project liaison, coordination and administration through a widely experienced company principal, you find many policy level decisions can be made *on the spot*. Investigate what Key Man Policy can mean to the projects you are planning.

BADGER

MANUFACTURING COMPANY

Engineers • Contractors • Designers • Manufacturers

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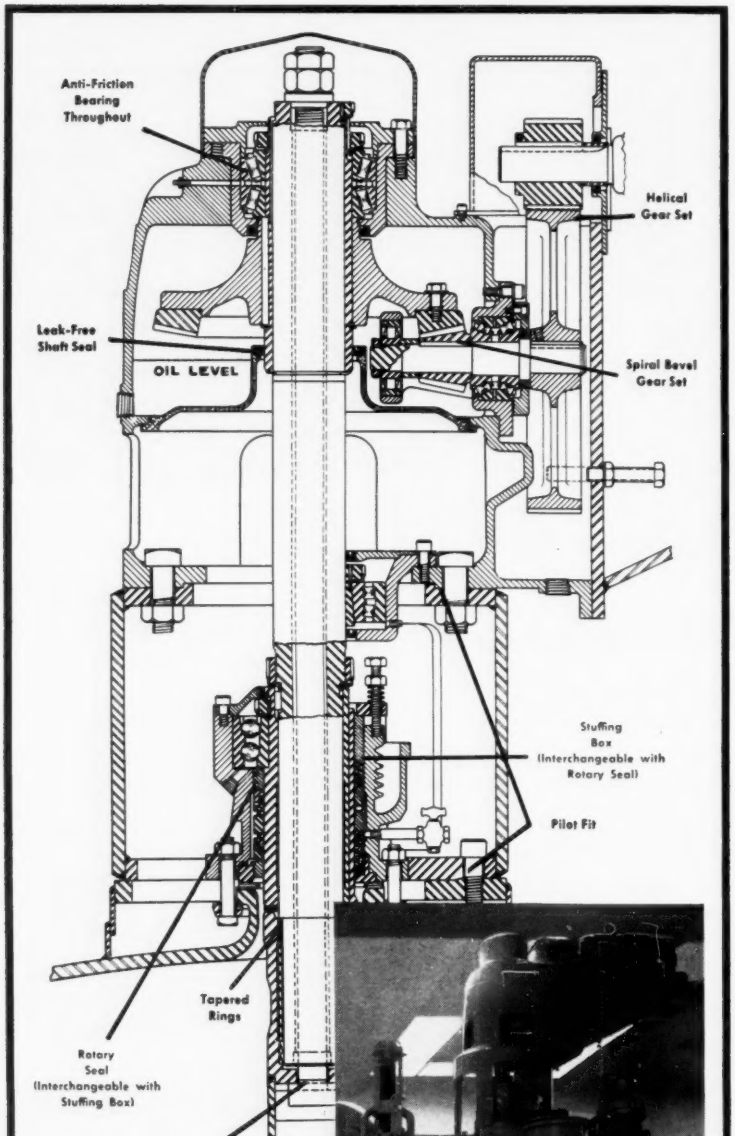
Badger-Comprimo S. A. Antwerp

PFAUDLER

Quietly cut maintenance up to 50% with the new BH Agitation Drive



When you first hear the BH Drive running you will know why it consistently cuts maintenance time and cost wherever it is used.

Its soft hum is the sure sign of a machine constructed to run week after week without once faltering or stopping for repairs.

A glance at its blueprint shows the specific areas where it either *eliminates* or *drastically reduces* your maintenance.

Get perfect alignment in minutes. Notice that the pedestal mount is *keyed* to the drive unit with a pilot fit. The pad mount is *machined* level at the factory. Then the drive is made to fit the mount just one way—the right way. You'd have to work some *not* to get perfect alignment every time.

Squeeze more life from a drive. Only two bearing areas support the BH Drive's shaft. This gives much wider bearing spread. Naturally that means less run-out, less chance of shaft whip. Seals last longer. Alignment is maintained all the time. The critical agitation speed is increased 50% over previous design. And, you can use a longer shaft without inserting a step bearing.

The bearings are all anti-friction types designed in excess of AGMA specifications. Under normal use, they can produce up to 300,000 hours of quiet, wearfree service.

Hardened and lapped spiral bevel gears are *standard*.

Speed up changeovers. You can use either stuffing box or mechanical seal with the BH Drive. Both come as integral assemblies, the Pfaudler-pac, which slip quickly into place. You never remove the drive from its mount to replace a stuffing box or seal.

The new draw bar is key-locked to your agitator. No threads to strip or stick. Tapered rings transmit torque when you draw the bar.

Prevent oil leakage. Besides putting in the usual oil-tight seals, we've recessed the oil reservoir through a well-type construction so that oil level is always *below* the seal. In normal operation oil can never slop over and seep down the shaft.

New motor levelling. Levelling the motor on the BH Drive is easier, too. The new design uses three levelling screws in place of the four jack screws on previous designs.

Three ratings available. You can get the BH Drive rated at 12, 30, or 60 HP at 100 RPM.

For more information on the drive, including complete specifications, send the coupon for our No. 972 Bulletin.

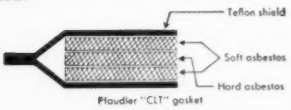
CORROSIONEERING NEWS

B. G. "Joe" Staples talks about Teflon gaskets for corrosive service

Mr. Staples runs our program of Pfaudler Technical Courses for plant maintenance men.

One of his special subjects is "Teflon Gaskets." Thirteen years ago he began devising a gasket for universally corrosion-free service on both glassed-steel and alloy equipment.

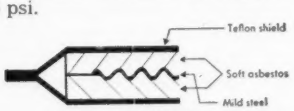
Many hundreds of tests later, he and his staff created two separate designs. Both combine Teflon's versatile corrosion resistance with the rigorous physical properties of their fillers.



Pfaudler "CLT" gasket

The Teflon envelope on this design licks the corrosion problem. The center core of hard, compressed sheet asbestos makes it rigid and strong. Thin layers of special soft asbestos let you compress the gasket to get a tight seal without danger to glassed-steel flanges.

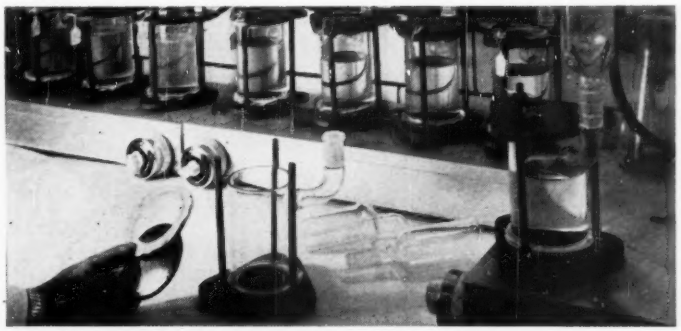
This design is for service up to 300° F. and internal pressures to 125 psi.



Pfaudler "CRT" gasket

For temperatures up to 500° F. and pressures to 300 psi, we developed this gasket with a thin corrugated mild steel core. This gives the gasket added strength and a springlike action which helps keep the seal tight and reduces the need for shimming.

FREE BULLETIN. To find out more about Teflon gaskets, send the coupon for Bulletin 502.



Test your corrosives FREE in Pfaudler lab

When you're not quite sure how a corrosive material will affect your glassed-steel or speciality alloy process equipment, send a sample to our laboratory.

A staff of expert corrosioneers will run a series of tests which approximate as closely as possible your actual processing conditions.

These men have run thousands of such tests and recognize quickly the telltale marks of corrosion.

They will report quickly, telling you the best material of construction to use and what use-life you can expect from it. Usually quantitive data are obtained in terms of mils per year of corrosion rates.

Run your own tests. If you prefer to run your own tests, we will gladly supply test equipment and procedures. Then do your own evaluation or return the test equipment to us for observation.

Test materials are all free except for the assembly shown in the picture. They include glassed-steel dumbbells which you suspend directly in your process, glassed-steel cups, or disc assembly shown above.

Full range of materials. Naturally glassed steel is our first interest and is usually the best answer to your corrosion problems. However, we also maintain a line of tantalum, titanium, zirconium, various Hastelloys, and various stainless steels for testing. Other metals and alloys on request.

Send for bulletins. The complete testing procedure and list of materials are contained in Bulletin 919. Bulletin 928 discusses the corrosion resistance of Pfaudler acid-alkali-resistant Glassed Steel. Check the coupon for copies.

PROCESS EQUIPMENT by PFAUDLER
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Please send me ☐ Bulletin 972, BH Series Drive ☐ Bulletin 502, Teflon Gaskets ☐ Bulletin 919 Glassed-Steel and Alloy Samples for Tests ☐ Bulletin 928, The Corrosion Resistance of Pfaudler Glassed Steel.

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See Chemical Engineering Catalog, pp. 1407-1418 for complete Pfaudler line.

Pete Gagas mixed the nylon emulsion for his polish in his bathtub until his landlady evicted him.

How Bathtub 'Brew' Launched

"Me and my wife, if we were both working and me still polishing cars, we'd have us a $20,000 house and a brand new Cadillac. But, I decided to go in business," wistfully laments Peter Gagas, president and virtually the entire staff of Nylwax Corp. (Worcester, Mass.).

Gagas is slowly and optimistically building up, from virtually nothing, a furniture and automobile polish business. In a new plant, a rented loft, production has more than doubled (to 2,500-3,000 bottles/-month) since November of last year. And since the total inventory is ordinarily carried in the trunk of Gagas's car, production is geared pretty close to sales.

One thing that makes Nylwax more interesting than other shoestring specialties companies is the product. Both the furniture and the automobile polish contain a nylon emulsion (claimed to give an extremely hard, but easy to apply, finish). Sure of the sales value of the name nylon and impressed by the plastic's durability, he devised his own system for emulsifying and formulating it.

In the new plant, Gagas alone will make the actual emulsion, behind locked doors in a small upstairs room. This room is currently the complete Nylwax plant and, small as it is, it represents quite a step upward from his first plant.

Bathtub Operation: When Gagas quit his parking-lot job to start producing polish, he lived in a third-floor walkup apartment, used the kitchen and bathroom for manufacturing, the living room (and his wife's bridge friends) for labeling. In spite of precautions, such as carrying raw materials and finished product in and out in his stocking feet at 2 a.m., his landlady became suspicious. One evening she went up to investigate why china closets were bouncing all over the apartment and found a half-horsepower mixer stirring polish in a

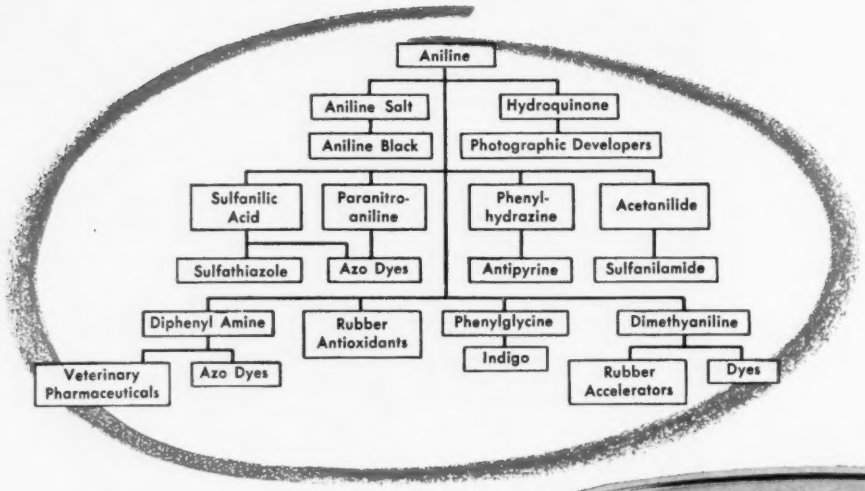
a Polish Maker

drum in Gagas's kitchen, and Gagas stirring another batch with a canoe paddle in the bathtub. Dubious about his explanation of "making a cake," she evicted him.

The walls of Gagas's current cluttered one-room plant-office-laboratory, are covered with posters advertising Johnson's, Simonize and other rival polishes. He has his eye on S. C. Johnson, in particular, hopes to someday overtake it.

Gagas takes his customers where he can find them. Nylwax Corp.'s major sale so far, is Boston's big Jordan Marsh department store.

Repeat orders are good and Gagas is opening up new territories at a steady rate. Banks, suppliers, and Worcester businessmen are backing him. As a one-man operation, Nylwax Corp. is a success — and Gagas is confident that the problems of more personnel, increased production and greater capital risks can be no worse than the problems he's faced alone.



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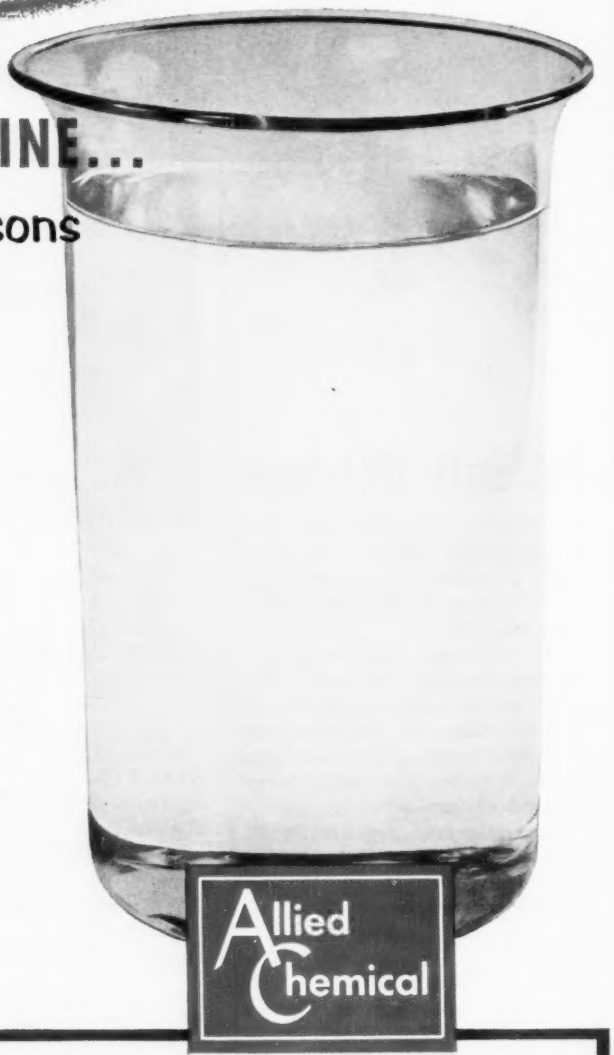

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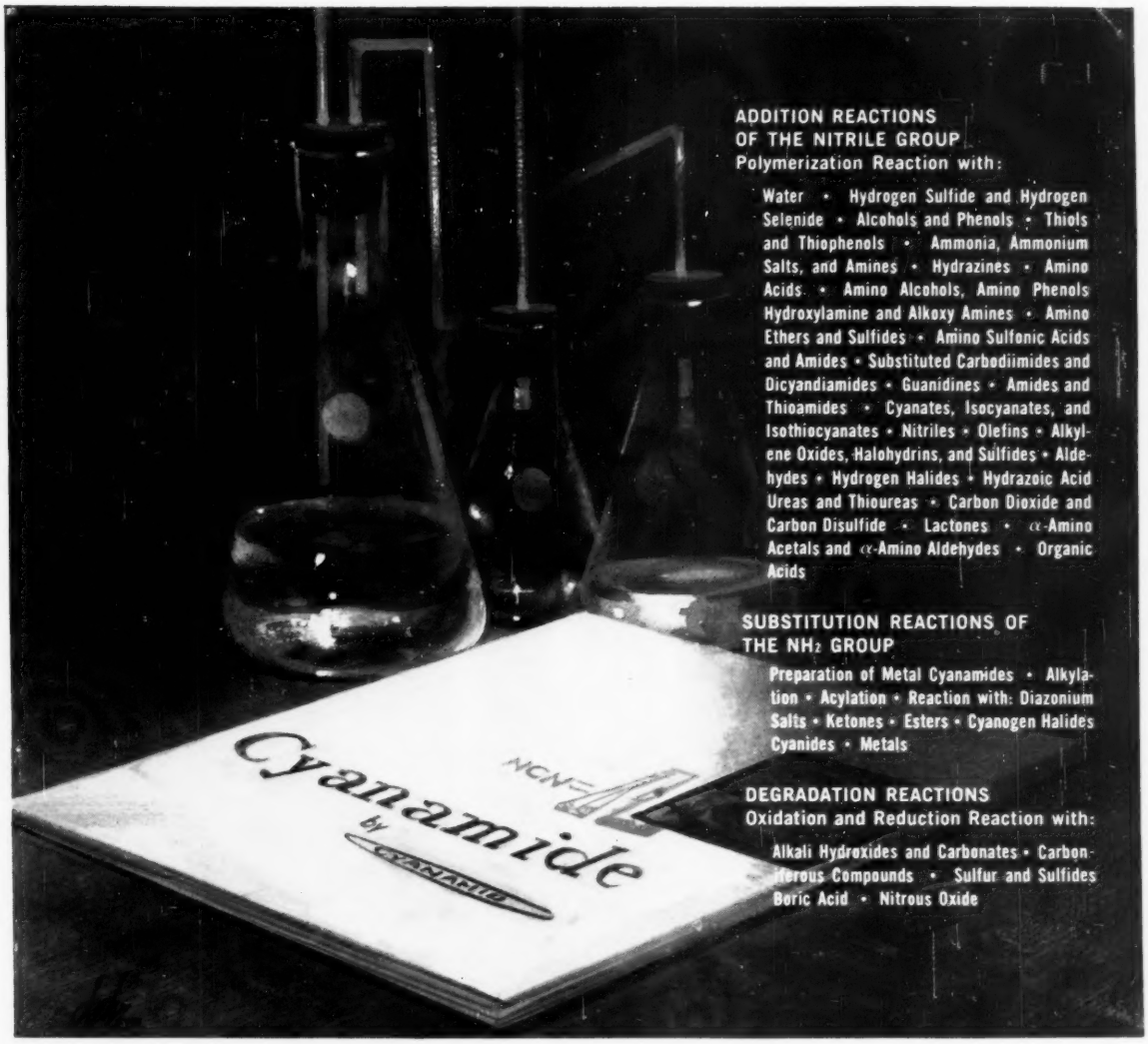

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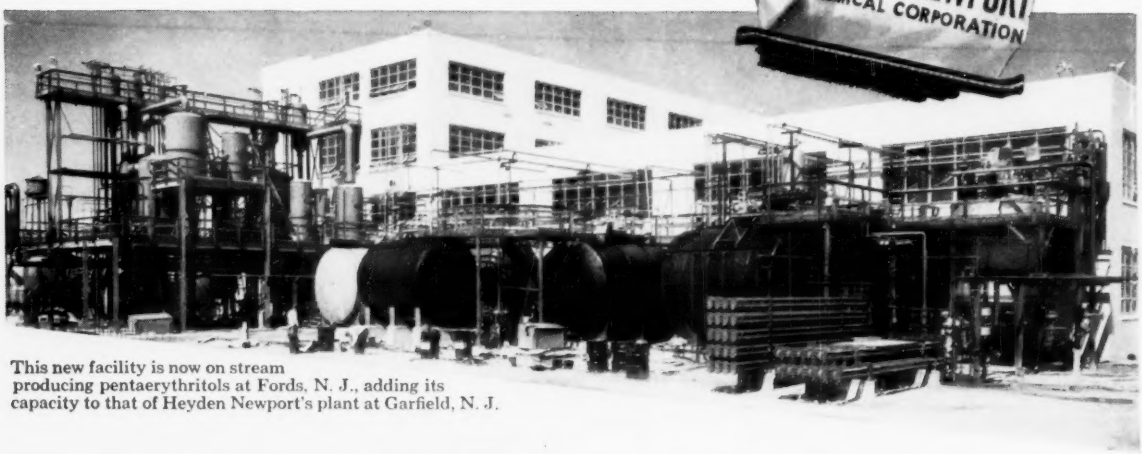

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